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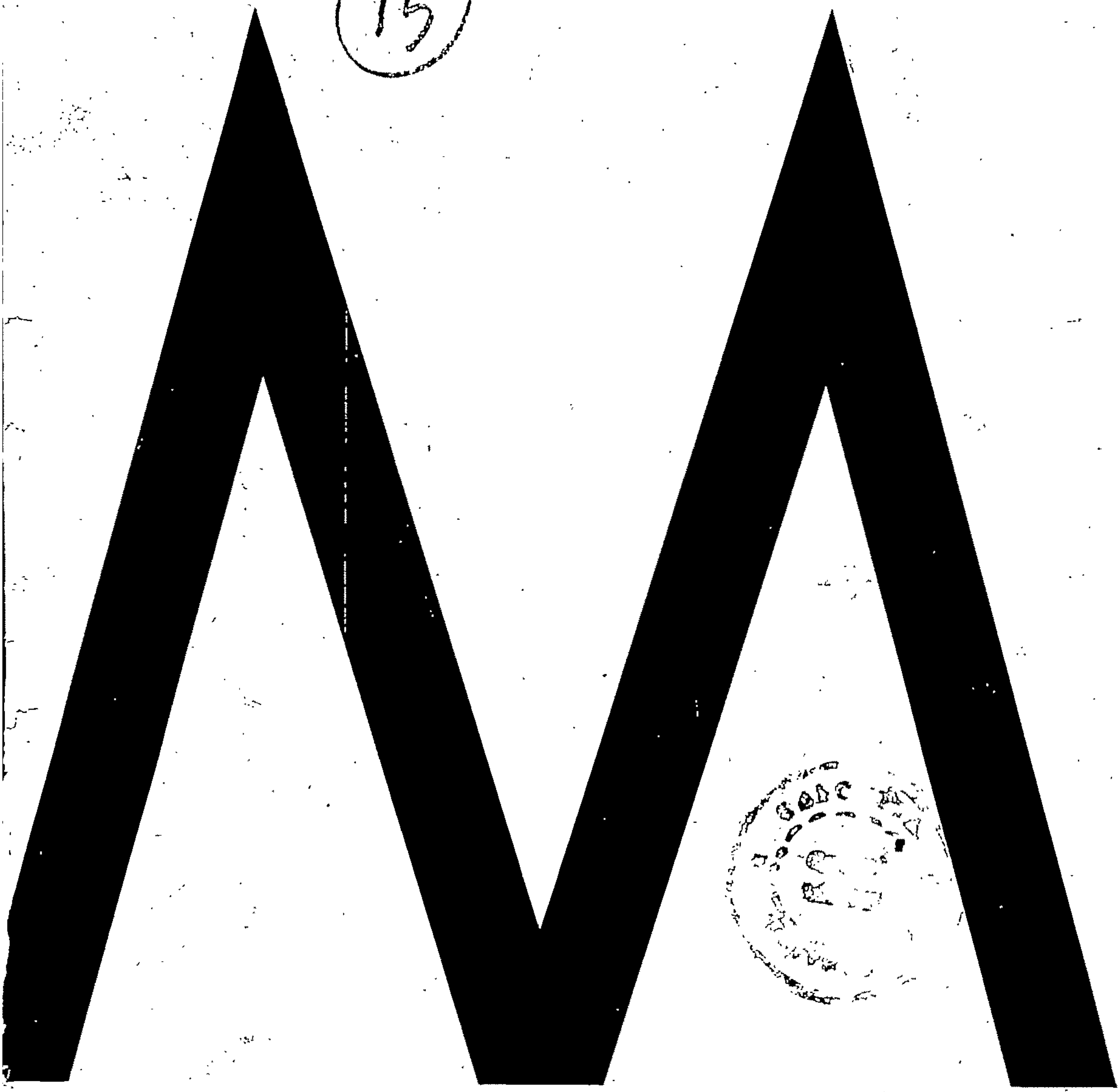

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UNTANGLING THE RELATIONSHIP BETWEEN DISPLAYED EMOTIONS AND ORGANIZATIONAL SALES: THE CASE OF CONVENIENCE STORES

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It has been proposed that the emotions expressed by role occupants influence the behavior of others. We hypothesized a positive relationship between employees' display of pleasant emotions to customers and sales in retail stores and tested that relationship in a sample of 576 convenience stores. An unexpected negative relationship was observed. A subsequent qualitative study suggested that sales is an indicator of a store's pace, or the amount of time pressure on clerks and customers, and that pace leads to displayed emotions, with norms in busy settings supporting neutral displays and norms in slow settings supporting positive displays. Reanalysis of the quantitative data confirmed that clerks in rapidly paced stores with high sales and long lines were less likely to display positive feelings than clerks in slow-paced stores.

> People want to be happy! Be happy and they will be glad they came to your store.
>
> Loyal, regular customers are a source of steady sales for your store. Smile!! Service with a smile and a friendly attitude will keep them loyal and keep them coming back!
>
> —From "Effective Customer Service Increases Sales,"
> a training program used by a chain of convenience stores

Much theory and research has focused on the role of emotion in organizational life. Emotions are typically viewed as intrapsychic states caused by factors such as job characteristics (Hackman & Oldham, 1980), stress (Kahn, 1981), relationships with supervisors (Bass, 1982), or compensation (Lawler, 1981). Such studies most frequently have examined the determinants of job

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satisfaction, which Locke defined as "a pleasurable or positive emotional state" (1976: 1300).

Recent theoretical work, however, has emphasized that employees' emotions are displayed as well as felt (Hochschild, 1979, 1983; Rafaeli & Sutton, 1987, 1989). A variety of forces may explain variation in organizational members' displayed emotions. Internal feelings certainly influence such behavior: satisfied employees may display genuine broad smiles and laughter during interactions with co-workers and customers; dissatisfied or tense employees may frown and groan during such transactions.

Yet there is an imperfect match between the emotions people feel and emotions they express on the job because employees are often expected to display emotions that are unrelated, or even in conflict, with their true feelings. Many organizations use practices, including recruitment and selection, socialization, and rewards and punishments, to assure that their members will conform to normative expectations, or "display rules" (Ekman, 1980: 87–88), that specify which emotions should be expressed and which should be hidden.

Organizations can support display rules by recruiting and selecting employees who are predisposed to express required emotions. Hochschild (1983) reported, for example, that Delta Airlines tries to select new flight attendants who will display good cheer to passengers and who have the emotional stamina to endure long, crowded flights without abandoning their smiles. Organizations may use socialization practices to teach display rules to newcomers. For example, a woman who supervises bill collectors reported that her subordinates learn—through both formal and informal means—to be pleasant to clients who are a month or two late on their Visa and MasterCard payments, to express firm disapproval to clients who are three or four months late, and to use nasty insults (e.g., "Why do you keep lying to me?") when speaking with clients who are five or six months late (Rafaeli & Sutton, 1989).

Organizations may also use reward and punishment systems to maintain display rules once socialization has been completed. Many service organizations like airlines, telephone companies, department stores, and grocery stores monitor their employees to assure that they are conveying correct emotions to customers (Hochschild, 1983; Rafaeli & Sutton, 1987). Employees who display the wrong emotions may be punished, and those who convey the right emotions may be rewarded. Management may even invite customers to help enforce display rules. For example, a store in Hayward, California, offers customers a five-dollar reward if a clerk does not offer them a "friendly greeting" and a "cheerful smile."

A primary reason that organizations develop and enforce display rules is that displayed emotions are thought to operate as "control moves." Goffman (1969: 12) defined control moves as an individual's strategic manipulation of expressions, including emotional expressions, to influence the behavior of others. Along those lines, the emotions displayed by employees in organizational settings can function as control moves that influence the behavior of clients and fellow organizational members (Rafaeli & Sutton, 1987).

A modest body of evidence confirms that expressed negative, neutral, and positive emotions can serve as control moves for individuals. Police interrogators convey negative and esteem-degrading emotions to suspects in an effort to gain confessions (Arther & Caputo, 1959). In the same vein, the incomes of professional poker players depend heavily on their ability to display neutral emotion, regardless of their internal feelings (Hayano, 1982). Furthermore, field stimulations (Salancik, 1979) have suggested that smiling cocktail waitresses receive larger tips than unsmiling ones (Tidd & Lockhard, 1978) and that smiling nuns garner larger donations than glum nuns (Bradshaw, 1980).

Our contention is that displayed emotions are not only descriptors of individual employees; conveyed emotions can also be attributes of organizations. Specifically, we proposed that displayed pleasant emotions can act as control moves at the organizational level of analysis.

DISPLAYED EMOTIONS AS ORGANIZATIONAL ATTRIBUTES

Customers of service organizations often interact with only one or two boundary-spanning employees during a given visit (Bowen & Schneider, 1985; Shamir, 1980). Furthermore, the emotions encountered by customers are displayed by individual employees. Yet customers typically develop an overall image of the emotions that members of a given organization will display. Such overall images arise because stimuli generalization occurs. Indeed, stimuli generalization enables authors of guidebooks to publish overall judgments about the level of courtesy that can be expected at hotels and restaurants (e.g., Birnbaum, 1987; Unterman & Sesser, 1984). After patronizing a service organization, customers may develop opinions about the *emotional front* they expect to encounter.

Those opinions—whether based on slight or extensive experience with an organization—reflect a characteristic of the organization because customers do not usually expect to be served by the same employee during each visit. Customers may also discern differences in emotional fronts because organizations differ in norms about displayed emotions (Hochschild, 1983; Rafaeli & Sutton, 1987). Norms are attributes of social systems rather than of individuals (Katz & Kahn, 1978).

Writings intended for managerial audiences also imply that the emotional front is a meaningful organizational attribute. Indeed, some recent managerial folklore suggests that employees who display good cheer to customers can enhance sales and customer loyalty (Ash, 1984; Hochschild, 1983; Peters & Austin, 1985; Peters & Waterman, 1982; Richman, 1984). The emerging literature on customer service (Czepiel, Solomon, & Surprenant, 1985; Parasuraman, Zeithamal, & Berry, 1985) also implies that belief. Those writings suggest that, when all other factors are held equal, the display of positive emotions by employees can, in the aggregate, act as control moves that bring about gains for an organization. The implication is that to the extent each potential customer associates a positive emotional front with a given organization, a larger proportion of the potential population will patronize that organization.

Theories of learning may explain why displaying warm feelings to customers can promote sales. Encountering employees who display warm, socially desirable feelings may be reinforcing for most people. Initial encounters with friendly employees may mark the start of an operant conditioning cycle (Skinner, 1953) in which the emotions displayed by employees are the reinforcers and patronizing the organization is the reinforced behavior. The probability that a given customer will visit an organization a second time is increased by employees' display of positive emotions. The organization's emotional front may also reinforce customer behavior indirectly through vicarious learning (Bandura, 1977). A customer may watch other customers encounter positive emotions or may visit a service organization after reading that its employees are nice, friendly, or polite.

Empirical support for this conceptual perspective was sought through study of a sample of 576 convenience stores. Specifically, we hypothesized that store sales would be greater to the extent that clerks displayed positive emotions during transactions with customers.

QUANTITATIVE AND DEDUCTIVE STUDY: METHODS

Research Context

These data were collected as part of an evaluation of employee courtesy in a large national chain of convenience stores. The corporation's human resources staff conducted this research as part of a chain-wide effort to enhance employee courtesy; top executives had decided that they could gain an advantage over their competitors by improving customer service in their stores. A primary reason that executives made this decision was that they had read *In Search of Excellence* and were swayed by Peters and Waterman's arguments that staying "close to the customer" (1982: 156) and having a "service obsession" (1982: 157) are characteristics of excellent firms.

During the year before these data were collected, the human resources staff had changed employee handbooks and the classroom training provided to new employees so that—rather than vaguely encouraging clerks to be friendly to customers—the training clerks received instructed them to greet, smile at, establish eye contact with, and say "thank you" to every customer. In addition, a variety of local and corporation-wide training programs were developed to teach store managers about how they could improve courtesy among their clerks. For example, the introduction to this article quotes a program entitled "Effective Customer Service Increases Sales" that included lectures, readings, role-plays, and group discussions to help managers improve the level of courtesy in their stores.

A variety of local and corporate-wide practices were used, both before and after the collection of the data, to reward clerks who acted friendly during transactions with customers. Clerks in most regions were informed that "mystery shoppers" would be used to observe levels of employee courtesy.

In some regions, clerks who were caught displaying the required good cheer to customers received a $25 bonus. In other regions, clerks who were observed greeting, smiling, establishing eye contact, and saying "thank you" could win a new automobile instantly.

The corporation held a contest, costing over $10 million, in which the owners of franchised stores and the managers of corporation-owned stores could qualify to enter a drawing for a million dollars if their clerks consistently offered good cheer to customers. The corporation also awarded large bonuses (over 25 percent of base salary) to regional managers when a high percentage of sales clerks in the stores they managed were observed greeting, smiling at, establishing eye contact with, and saying "thank you" to customers.

We had no influence over the design and implementation of this data gathering. The firm gave us the data because one of us had attended graduate school with the firm's director of field research. Other corporate executives were also interested in our findings because most of them believed that employee courtesy led to increased sales. They were curious to discover if quantitative evidence would support their beliefs. Small but significant relationships between displayed emotions and store sales could mean millions of dollars of sales for this national chain. For example, 2 percent increase in sales would increase corporate revenues by over $100 million.

Sample

The sample comprised 576 of the convenience stores in this national chain. There are over 7,000 stores in the United States and Canada, 36 percent of which are franchised. The corporation owns the remainder. The typical store has 8 to 10 employees, with a range of 6 to 20 employees. The stores sell a wide range of items, including food, drinks, cigarettes, and magazines. The corporation uses a variety of rules and inducements to assure that there will be similarity in the products sold in each of these stores, but there is variation because people who manage the corporation's stores and people who own franchised stores have some authority to decide what products will be sold. The stores with greater sales tend to carry larger inventories. Yet, compared to supermarkets, these stores all carry tiny inventories because they have little storage space. Thus, they must be replenished frequently by suppliers.

A random sample of 576 urban stores was selected for the study. The stores selected were from all 18 divisions in the United States and Canada. The corporation defines divisions, which include between 300 and 600 stores, by geographical boundaries. The firm chose the four most heavily populated urban districts (35–40 stores) from each division for the research, for a total of 72 districts. Rural districts were excluded to reduce travel costs. Eight stores were randomly selected from each district, for a total of 576 stores. Thus, the sample is representative of the urban stores in this national chain.

The extent to which employees display positive emotions to customers can be considered a store, or organization, attribute, as we suggested earlier. Yet this attribute can only be observed in the behaviors of individual employees. Thus, displayed emotions were measured by observers who coded clerks' behavior during transactions with customers. These observations were made during three months in 1984. Observers visited each of the 576 stores twice: once during the day shift and once during the swing shift. They visited 25 percent of the stores (144 stores) a third time during the night shift (11:00 p.m.–7:00 a.m.). A store visit could occur at any juncture in each eight-hour shift since observers also worked shifts that were approximately eight hours. The most efficient route of travel usually determined the order in which selected stores were visited.

Observers coded as many as 20 transactions between customers and clerks during each store visit, for a total of up to 60 transactions per store. The number of transactions coded during a visit ranged from 1 to 20 and was determined primarily by the number of customers in the store during the visit. The modal number of transactions coded at each visit was 8 and the mean was 9. The final sample included 11,805 clerk-customer transactions. A total of 1,319 clerks were observed; 44 percent were men, and about 75 percent of the customers were men.

Procedures

Observers acted as incognito participant observers (Webb, Campbell Schwartz, Sechrest, & Grove, 1981: 200). They were participant observers since they acted like typical customers. The firm notified store managers that mystery shoppers might be visiting their stores during the spring or summer of 1984 to observe employee courtesy, but managers received no specific information about the timing of the visits.

The firm's marketing information indicated that typical customers were working class men and, less often, women, 18 to 34 years old. Observers were selected accordingly and instructed how to dress. The firm did not hire observers especially for this task. Rather, members of the corporate staff, particularly of the human resources staff, who fit the profile of a typical customer were asked to spend one to four weeks working as observers. The people who gathered the data held a wide range of jobs in the corporation, including those of organizational development specialist, executive development specialist, director of field research, secretary, and marketing manager.

The corporation's director of field research trained the other corporate employees who volunteered to help gather the data. Before visiting stores included in the study, each volunteer observer visited some pretest stores with the director of field research. They coded clerks' behaviors and compared observations after each visit. The volunteers and the director discussed and clarified differences in coding until they agreed consistently.

Observers visited each store in pairs. They acted independently and did not communicate with each other while inside the store. Observations were noted on preformatted three-by-five-inch cards. Only one clerk, the operator of the primary cash register, was observed during each visit, even if more than one register was operating. Observers walked around the store for a few minutes and noted how well the store was stocked with merchandise. They also noted whether the clerk was wearing a name tag and a smock and whether the smock was clean. Typically, the observers then walked to the magazine rack or coffee pots, which were usually close to the primary cash register. Observers usually coded clerks' behaviors toward customers from those vantage points. The observers then selected a small item like a candy bar and stood in line. They continued to note employees' behaviors toward customers while standing in line. Observers left the store after paying for their purchases.

The amount of time in each store varied from 4 to 12 minutes; the amount of time could not be predetermined because observers were instructed to stay in each store as long as possible. But they also had to avoid evoking suspicion. The visit was kept short if there were few customers in the store to prevent the clerk's becoming suspicious. Observers also noted if they felt that a clerk suspected that they were not ordinary customers. Clerks were thought suspicious in less than 3 percent of the observations; we excluded these observations from the analyses.

The firm's director of field research, an experienced organizational researcher who had responsibility for designing and implementing this study, established the interobserver reliability of this method. The director visited a sample of 274 stores and observed a clerk at each store. During each of those visits, one of seven other members of the data-gathering team accompanied the director. Interobserver reliability was assessed by comparing the research director's coding of clerks' emotional displays with the coding of the seven second observers. The correlations between the research director's coding and the second observers ranged from .94 to .67. The mean correlation was .82 and the median correlation was .85.

Predictor Variable: Display of Positive Emotion

The concept of displayed positive emotions is related to employee courtesy, an idea mentioned often in the literature on service organizations (Czepiel et al., 1985; Schneider, Parkington, & Buxton, 1980). The concept of courtesy, however, is broader than displayed positive emotion, since courtesy may also include working quickly, dressing neatly (Parasuraman et al., 1985), and doing favors for customers (Shamir, 1980). The display of positive emotion refers specifically to presenting a warm outward demeanor during transactions with customers.

The corporate researchers gathered evidence about two social amenities, greeting and thanking, and two forms of nonverbal behavior, smiling and establishing eye contact, that reflected the presentation of a warm outward demeanor. These four aspects of clerks' displayed positive emotion were observed at the transaction level of analysis and were operationally defined as follows. (1) Greeting: only "Hello," "how are you today," or another polite phrase at the outset of a transaction was considered to be a greeting. "Is that all for you?" and "Anything else?" were not coded as greetings. (2) Thanking: the word thank or a derivative had to be used. (3) Smiling: a smile was considered a noticeable uptwist of the lips (Tidd & Lockard, 1978). (4) Eye contact: a direct gaze by a clerk was coded as a sincere attempt at eye contact, regardless of whether a customer reciprocated.

The observers assigned a value of 1 if a behavior was displayed and a value of 0 if it was not displayed. Thus, each transaction was coded as to whether the clerk smiled at, greeted, thanked, and maintained eye contact with the customer. The data were aggregated to the store level of analysis to form an index of display of positive emotion as a store attribute.

For each store, a score was computed for each of the four emotional expressions by calculating the proportion of transactions in which the behaviors were displayed over the total number of transactions coded. For each store, the variable measuring the display of positive emotion was an index composed of the mean level of greeting, thanking, smiling, and eye contact observed in that store ($\alpha = .76$).

The aggregation of transaction-level data to an organizational level can be justified if the ratio of between-group variance to within-group variance is statistically significant. A significant ratio suggests that the aggregated variable is measuring an organizational-level construct (Rousseau, 1985). We performed an ANOVA with display of positive emotion as the dependent variable and store identifiers as the independent variable. The between-store variance was significantly greater than the within-store variance (ms = .82 and .06, respectively; $F_{576,\,11{,}804} = 14.311$; $p < .01$).

Control Variables

This study sought to document the effects of a store's emotional front above and beyond the effects of other factors. Thus, it was important to control for the effects of other store attributes on store sales. Observers gathered data for five control variables: clerks' gender composition, customers' gender composition, clerks' image, store's stock level, and length of line. Data for three other control variables were obtained from company records: store ownership, supervision costs, and geographical region. We operationally defined those variables as follows. (1) Clerks' gender composition was defined as the proportion of a store's clerks who were women. Observers noted the gender of the clerk during each visit. In order to aggregate to the store level of analysis, we computed the proportion of women over the total number of clerks observed across all visits as an index of the store's gender composition. We used this measure to control for variation in displayed emotion due to gender (Deaux, 1985; Putnam & McCallister, 1980). (2) Customers' gender composition referred to the proportion of customers who were women. The observers noted the gender of the customer in each transaction. We aggregated those observations to the organizational level by computing the proportion of woman customers in each store over all the customers present during all observations in the store. This variable was introduced to help account for the different buying patterns of men and women (Engel, Blackwell, & Miniard, 1986). (3) Clerks' image was the degree to which clerks in a store maintained the dress code specified by corporate guidelines. This variable had three items: whether clerks wore a smock, whether their smock was clean, and whether they wore a name tag. Ratings were on a 2-point scale with 1 = no and 2 = yes ($\alpha = .74$). This variable was used to help control for compliance with other corporate norms. (4) For store's stock level, three items were used to rate how well each store was stocked with merchandise. Observers used 5-point Likert scales to rate the extent to which the shelves, snack stands, and refrigerators were fully stocked ($\alpha = .81$). We controlled for this variable because high stock levels may promote strong sales regardless of displayed emotions. (5) For average line length, observers recorded the largest number of customers in line at the primary cash register during each store visit. Average line length reflects the mean number of people standing in line across all visits to a store. We controlled for this variable because stores with longer lines may sell more than others, regardless of displayed emotions. (6) Store ownership captured whether a store was franchised (coded 1) or corporation-owned (coded 0). The firm's executives have the authority to enforce policies about employee courtesy in corporate stores but can only encourage such practices in franchised stores. (7) Store supervision costs was the amount of money spent by the corporation on salaries, benefits, and training costs for the field supervisors who dealt directly with each store manager. This corporation provided us with standardized data about the number of dollars spent on each store for such supervision. A field supervisor typically oversees the operation of eight to ten stores, but such supervision costs varied considerably across stores in the sample. Variation occurred because regional, district, and division managers have some autonomy over how many stores each supervisor oversees, the amount such supervisors are paid, and how much training they receive. This variable was used to help control for the influence of quality of supervision on store sales. (8) Region reflected the corporation's grouping of stores into four geographical regions, each under the authority of a regional vice-president; the northeastern region was coded 1; the western, 2; the midwestern, 3; and the southern, 4. We used this variable to control for variability in administrative practices and for differences in regional norms about displayed emotion. The variable was dummy-coded so that it could be used in multiple regression analysis.

Criterion Variable: Total Store Sales

The criterion variable used in this study was total store sales during the same year that the observational data were gathered. Total store sales was the dollar value of sales for each store from all products sold during the 1984 calendar year, including grocery items, cigarettes, dispensed drinks, hot food, video games, oil, and gasoline. This measure was obtained from company records and was standardized among the stores included in the sample. We received standardized rather than raw data because executives preferred not to release that sensitive financial information. Standardization was accomplished by transforming total store sales into a new variable by assigning a value of 0 to the mean of each variable and a value of 1 to the standard deviation. The value for each store was the number of standard deviations that the store's sales deviated from the mean.

RESULTS OF THE QUANTITATIVE AND DEDUCTIVE STUDY

Table 1 presents the means, standard deviations, and intercorrelations of study variables. We performed multiple regression analyses to determine the relationship between the display of positive emotion and total store sales following a hierarchical procedure. The eight control variables were entered simultaneously into the first equation, which yielded a multiple *R* of .28 and an adjusted *R*-square of .06. The second regression equation included the eight control variables along with the index of displayed positive emotion. Total store sales was the criterion variable in both equations.

Table 2 reports results for the complete model. The control variables significantly related to total sales were store supervision costs, customers' gender composition, clerks' gender composition, and average line length. The second equation yielded a significant beta for the display of positive emotion, an *R* of.30, and an adjusted *R*-square of .07.

The statistically significant beta weight of the variable measuring display of positive emotion indicates a significant increment in *R*-square. That is, compared to the variance explained by the first equation, which included only control variables, the new variable included in the second equation contributed significantly to the variance explained (Cohen & Cohen, 1975). But the direction of the observed relationship contradicted our hypothesis: higher levels of displayed positive emotion were associated with lower levels of store sales. This finding was unexpected and confusing; it was also thought-provoking.

TABLE 1
Means, Standard Deviations, and Intercorrelations of Quantitative Variables[a]

Variables[b]	Means	Standard Deviations	1	2	3	4	5	6	7	8
1. Display of positive emotion	0.51	0.23								
2. Store ownership	0.36	0.48	−.06							
3. Stock level	3.26	0.59	.26	.23						
4. Customers' gender composition	0.19	0.13	−.04	.07	.08					
5. Clerks' gender composition	0.56	0.37	.13	−.11	−.07	−.08				
6. Clerks' image	0.74	0.34	.13	−.67	−.04	−.05	.10			
7. Supervision costs	0.00	1.00	−.01	.16	.00	−.00	.08	−.13		
8. Average line length	2.88	1.16	−.18	.04	.10	.28	−.00	−.02	.06	
9. Total sales	0.00	1.00	−.06	.00	.09	.10	.09	−.02	.13	.18

[a] $n = 576$.

[b] Store ownership was coded 0 for corporation-owned stored and 1 for franchised stores. Customers' gender composition is the proportion of woman customers. Clerks' gender composition is the proportion of women clerks. Supervision costs and total sales were standardized for all stores included in the sample; thus, the mean is 0.00, and the standard deviation is 1.00.

TABLE 2
Beta Weights of Store Emotional Display and Control Variables as Predictors of Total Store Sales[a]

Variables[b]	Total Sales
Store ownership	−.10
Supervision costs	.13**
Stock level	.06
Customers' gender composition	.07†
Clerks' gender composition	.11**
Clerks' image	−.07
Average line length	.14**
Region 1	−.07
Region 2	.11
Region 3	.08
Display of positive emotion	−.10*
Multiple R	.30
Adjusted R-Square	.07**

[a] $n = 576$.

[b] Store ownership was coded 0 for corporation-owned stores and 1 for franchised stores. Customers' gender composition is the proportion of woman customers. Clerks' gender composition is the proportion of woman sales clerks. Region 1, region 2, and region 3 are dummy codes representing four regions.

†$p < .10$, two-tailed test.

*$p < .05$, two-tailed test.

**$p < .01$, two-tailed test.

The modest positive relationship between line length and total store sales, along with the modest negative relationship between line length and the display of positive emotions (see Table 1), gave us a hint that by thinking about the differences between slow and busy settings we might be able untangle the relationship between displayed emotion and store sales. As a result, we gathered evidence about the differences between slow and busy settings as part of the qualitative research conducted to help understand why the quantitative evidence contradicted our central hypothesis.

THE QUALITATIVE AND INDUCTIVE STUDY

Scholarly knowledge is developed through alternating phases of induction and deduction. When empirical observations do not confirm a theory, investigators should embark on a new phase of theory building so that they can revise or reject the inadequate framework and replace it with a new framework (Merton, 1957; Wallace, 1971). As a result, our paper does not end with the usual discussion of quantitative findings. Instead, we conducted a qualitative and inductive study to help explain the unexpected negative relationship between the expression of positive emotion and store sales. The qualitative data provided rich information that helped us to view the convenience stores in a different light and to develop new predictions that could be tested in a reanalysis of the quantitative data.

Qualitative Methods

The qualitative phase included case studies, a day spent working as a clerk, conversations with manager, a customer service workshop, and about 40 visits to different stores.

Case studies of four stores in Northern California were conducted. We used data on employee courtesy and store sales collected by the corporation to select cases that fit each of following four categories: (1) high sales and clerks who typically displayed positive emotions to customers, (2) high sales and clerks who typically did not display positive emotions, (3) low sales and clerks who typically displayed positive emotions, and (4) low sales and clerks who typically did not display positive emotions.

A pair of one-hour observations of transactions between clerks and customers were conducted in each of the four stores, one during a busy time and one during a slow time. Clerks working during each observation consented to participate in the study. An observer stood or sat near the cash register and took notes on predetermined topics, including customer demographics, line length, the number of customers in the store, customer behavior, and pressure from other tasks (e.g., stocking, cleaning, and dealing with vendors). The observers also had informal conversations with clerks about customer service.

A semistructured interview was conducted with the manager of each store. The interview contained 17 open-ended questions about the manager's prior experience; the selection, socialization, and reward systems used in the store; employee courtesy; and its influence on store sales. These questions appear in the Appendix. Interviews lasted between 30 and 60 minutes.

The qualitative study included a brief but instructive experience in which one of the authors spent a day working as a clerk in a store. About 30 minutes of training was provided, which included viewing a film on employee courtesy. This store had previously been rated as having low sales and frequent display of positive emotions.

We also had extensive in-person and telephone conversations with managers about the expression of emotion by store employees. At least 150 hours of conversations took place with corporate executives, customer service representatives, field supervisors, and store managers. These informal conversations focused on employee courtesy, especially the negative relationship we had observed between displayed positive emotion and sales. We also discussed interventions that could be used to enhance courtesy.

One of the authors attended a customer service workshop designed for franchisees and store managers. The two-hour program focused on methods for coaching and rewarding clerks in order to enhance their courtesy and satisfaction. It also provided an opportunity to hear managers discuss the role that expressed emotions play in the stores. Finally, the qualitative phase included approximately 40 visits to different stores located in three geographical regions. We made small purchases during those visits in order to observe clerks' displayed emotions.

The method of qualitative analysis used here draws on descriptions of how to generate theory by Glaser and Strauss (1967) and Miles and Huberman (1984). This juncture in the research was primarily inductive since facts were gathered to help us generate new theory. Nonetheless, as Miles and Huberman suggested, the data gathering and the interpretations attached to the data were guided by our explicit prior assumptions. Specifically, since the quantitative results suggested the importance of a store's average line length, we gathered qualitative data about store pace. We also made initial conceptual speculations about the differences between slow and busy stores.

We had frequent conversations during and after the collection of the qualitative data to discuss how we should modify the theory in light of the evidence. We traveled back and forth between the qualitative evidence and our conceptual explanations about why a negative relationship had emerged between displayed positive emotions and sales. Collecting and analyzing the five new sources of data led us to refine our understanding of differences between busy and slow settings and the implications of store pace for displayed emotions.

THE REVISED PERSPECTIVE: BUSY AND SLOW TIMES AS CUES FOR EXPRESSED EMOTIONS

> Customer: Can I please have a plastic bag for my merchandise?
>
> Sales Clerk: Lady, we don't have time for your please and thank you. Can't you see how busy we are? Just say what you want.
>
> —A transaction between one of the authors and a clerk in very busy store.

The qualitative evidence led us to conclude that the expression of positive emotion by clerks may not be a control move that influences the buying behavior of customers who visit these stores. The "service ideal"—the aspects of service that customers should expect to receive when they patronize an organization—portrayed in advertising and promotions for this national chain had historically emphasized speedy service and name-brand products rather than good cheer. Our conversations with executives also indicated that encounters with friendly clerks had only recently been included as part of the corporate marketing strategy.

Store managers throughout the corporation had received literature emphasizing the importance of offering smiles, greetings, eye contact, and thanks to customers only a few months before the quantitative data were gathered. Training programs for new employees had also recently been changed to include segments encouraging those behaviors. Further, some regional managers had implemented new customer service training programs like the one quoted at the outset of this article.

Yet the qualitative evidence that we encountered led us to question whether this new service ideal had been accepted. Managers and clerks typically believed that outright rudeness drove away customers. But they often contended that friendliness and warmth were unnecessary because "our customers just want to get in and out quickly" and "our customers don't care if the clerk is perky."

Nonetheless, the qualitative evidence did help us untangle the relationship between expressed emotion and store sales. The data led us to propose that store sales reflect store pace, or the amount of time pressure on clerks and customers. It also led us to propose that store pace is a cause, rather than an effect, of expressive behavior in the convenience stores studied.

Qualitative comparisons of stores during slow and busy times suggested that store pace is a cue for norms about expressed emotions. We followed Bettenhausen and Murnighan's (1985) view that norms are implicit agreements among members of a social system concerning which scripts they should and should not use to guide the behavior. Scripts are cognitive structures that specify "basic actions that can be executed in a range of possible manners and contexts" (Nisbett & Ross, 1980: 34). Scripts help people decide how to act in given situations.

Novel situations require participants to engage in considerable trial and error before they reach tacit agreement, or develop norms, about which scripts should guide actions (Bettenhausen & Murnighan, 1985). But the settings examined in this research were not novel. The membership of these stores is in constant flux as customers come and go, but both customers and clerks have well-developed scripts because of their extensive experience with such settings. Corporate records indicate that the average clerk serves hundreds of customers each day. Customers also have extensive experience with such stores; the average customer visits three times a week. Moreover, customers have much related experience with other businesses designed for convenience, such as fast-food restaurants. As a result, the scripts that guide behavior in these transactions are enacted quickly and frequently.

Indeed, there is usually instant, tacit agreement between clerks and customers about which norms of emotional expression should guide their behavior in such stores. Store pace is a primary cue that determines which norms apply at a given moment. During busy times, both clerks and customers tacitly agree that the expression of pleasant emotions is not essential. Conversely, both clerks and customers tacitly expect that pleasant emotions should be expressed during slow times.

Norms During Busy Times: Customers as Objects for Rapid Processing

Data from the five sources summarized in Table 3 led us to conclude that a set of tacitly agreed upon, but well-defined, norms exist during busy times that encourage clerks in convenience stores to view customers as inputs for rapid processing. We also propose that those norms are reflected in differences at the store level of analysis because busy stores have a higher proportion of times during which clerks view customers—and customers view themselves—as inputs for rapid processing.

TABLE 3
Qualitative Evidence About the Influence of Store Pace on Displayed Emotions

Sources of Data	Evidence About Displayed Emotions in Stores During Busy Times	Evidence About Displayed Emotions in Stores During Slow Times
Four case studies	One store manager reported that clerks were less likely to be friendly during busy times. Customers are "more stressed and tense," as another store manager put it. Observers also noted that clerks tended to become less friendly during busy times. In both stores that were low on expressed positive emotion, there was a tendency to wait longer to open a second register than in the two stores that were high on the expression of positive emotion. Thus, during busy times, lines tended to be longer in the two "unfriendly" stores than in the two "friendly" stores.	The store managers reported that clerks were likely to be friendly during slow times; the observers noted that clerks tended to become more friendly during slow times. The observers also noted that extended conversations took place between clerks and regular customers during slow times, especially in the two "friendly" stores.
Day spent working as a clerk	The field notes reveal the following: [when the line of customers got long] "I never looked up at the customers. I never established eye contact. I never said thank you. I was breaking the rules, and I knew it. But I couldn't help it."	The field notes reveal the following: [during slow times] "There were regular customers. And my co-workers and I would often engage in brief, friendly banter, and sometimes even extended conversations, with these folks."
Conversations with managers	The negative relationship between positive emotion and performance was attributed to the "Manhattan effect," the notion that New Yorkers are less polite than people in other parts of the country because they are under greater time pressure.	There was widespread agreement that lack of courtesy should not be tolerated when it was slow because there are no excuses for such behavior.
Customer service workshop	A store manager remarked, "Customers who are in a long line don't care if we smile or not. They just want us to run like hell."	There was a general discussion about slow and busy stores. All agreed that it was easy to smile, greet, establish eye contact, and thank customers when it was slow, but being courteous was thought to be a challenge when it was busy.
Store visits	We noticed that clerks and customers tried to move as fast as possible when the store was busy. Everyone was less friendly. We also found that our own irritation from waiting in long lines was sometimes expressed to clerks.	We noticed that clerks tended to be more friendly when there were fewer customers in the store; customers and we ourselves also tended to be more friendly during slow times.

Isenberg (1981) reported a pilot study in which he found that people under time pressure expected themselves to be more task-oriented and less friendly. The pattern observed in the qualitative data was consistent with Isenberg's findings. When there were many customers in a store and lines were long, both clerks and customers usually tried to move as quickly as possible to speed transactions. We heard clerks apologize for moving slowly during busy times. We also heard customers apologize for making large purchases when a long line of customers was waiting behind them. Such apologies by clerks and customers were heard even if only two or three people were standing in line because these stores are so strongly oriented towards convenience.

Consistent with Isenberg's findings, data from the case studies indicated that both clerks and customers in the busiest of the four stores were the least likely to display positive emotions; this store had the highest proportion of busy times. Moreover, visits to all four stores during busy times revealed that employees were less likely to offer greetings, eye contact, smiles, and thanks to customers than they were during slow times. Indeed, as Table 3 reveals, all five data sources suggested that positive emotions were less likely to be expressed during busy times.

Two reasons may explain why such norms are in place during busy times. First, such norms help maintain efficiency. Katz and Kahn (1978) and Feldman (1984) proposed that norms are enforced when they express core values of an organization or group and clarify what is distinctive about a social system. Efficiency is a core value for these convenience stores. Advertisements for the chain emphasize how quickly customers can get in and out of the stores. Indeed, speed of service is perhaps the primary reason that customers visit these stores.

Greeting, smiling at, thanking, and establishing eye contact with customers take only a small amount of extra time. But displaying those simple behaviors can encourage customers to prolong a transaction. One experienced clerk who worked in a store that was often busy told us that he learned not to smile or establish eye contact with customers because "being friendly" often caused customers to start prolonged conversations that he did not have time to finish. We also observed that people waiting in line are less likely to become irritated at "no nonsense" clerks who focus only on moving customers along quickly. Courteous clerks may be able to process customers just as quickly as clerks who do not interact with customers, but they appear to be slower. In short, customers and clerks are not likely to exchange good cheer during busy times because such acts hamper objective and perceived efficiency.

Second, a busy pace can create stress. Several of the clerks we spoke with reported feeling tense when lines were long. Table 3 also quotes a store manager who reported that customers feel tense when lines are long. Overloaded clerks who are displaying their inner feelings—rather than trying to follow corporate display rules—are not likely to be smiling. Even the display of anger or irritation may be acceptable during busy times; it is clearly more acceptable than it is during slow times. Expressing irritation toward people who hampered efficiency was found to be especially legitimate during busy times.

Indeed, we encountered some evidence that sanctions are applied to both clerks and customers who hamper efficiency during busy times. The following incident occurred during the day that one of us worked as a clerk: A customer initially requested only a hot dog and a soft drink. In the middle of his purchase, however, he decided to "grab a few things" including two Bic lighters, two toothbrushes, Ex-Lax, and aspirin; the three people waiting in line started glaring at this customer. To make things worse, the clerk did not have the skill to process this complicated order rapidly; he was also sanctioned. One impatient customer commented pointedly that "it is hard to get good help these days."

Along similar lines, a customer service manager told us about a time when—even though there was a line of seven customers at the primary cash register—the second clerk continued an animated conversation with his friend rather than open a second cash register. Both the clerk operating the cash register and a regular customer who was in line reacted by taunting the chatty clerk.

Norms During Slow Times: Customers as Entertainment

Norms during slow times contrast strongly with those during busy times. As with busy times, a set of tacitly agreed upon, but well-defined, behavioral expectations can be identified for slow times. Isenberg's (1981) previously cited laboratory research suggests that people under low time pressure expect themselves to be less task-oriented and more friendly than those under high time pressure. Findings from the five sources of qualitative evidence summarized in Table 3 are consistent with those findings. Clerks were more likely to greet, smile at, establish eye contact with, and say "thank you" to customers during slow times. Customers were also more likely to be friendly. Moreover, the norms for expressive behavior during slow times are also reflected at the store level because slow stores have a high proportion of slow times.

We identified three primary reasons why norms in slow stores support the expression of positive emotion. First, pressure on clerks for speed and efficiency is low during slow times. Clerks can take the time to greet customers, establish eye contact, smile, and say "thanks" without suffering the negative consequences that occur during busy times. Indeed, as Table 3 indicates, managers believe that lack of courtesy should not be tolerated during slow times because there is no excuse for such behavior.

Second, our observations suggested that customers who enter stores during slow times have different expectations about what constitutes correct behavior. In contrast to scripts for busy times, scripts for slow times have more "scenes" (Nisbett & Ross, 1980: 34) that emphasize interpersonal exchanges and the display of positive and esteem-enhancing emotions. Customers who entered stores that had few other customers were more likely to offer

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greetings and smiles to clerks. We also noticed this pattern in our own behavior when we visited stores.

Third, and perhaps more important, clerks in slow stores were often genuinely happy to see customers enter the store. They were most enthusiastic about seeing regular customers, but they acted happy even if it was someone they had never met. Recalling Roy's (1959) classic discussion of "banana time," our data indicated that informal social interaction with customers was an important means for introducing variety into a boring job. Clerks are especially friendly during slow times because they view customers as entertainment. Thus, the expression of positive emotions during slow times— and, in the aggregate, in stores that are usually slow—may be influenced more strongly by true feelings than by corporate display rules.

Field notes from the day one of us spent working as a clerk illustrate that point:

> There weren't a lot of customers. I was bored with the jobs they were giving me. When no customers were around, I'd spend my time putting prices on things, putting cans on shelves, and doing thrilling jobs such as cleaning the nacho machine. I'd get excited when a customer walked into the store because talking to customers was the only vaguely interesting thing to do.

In short, norms for slow times encourage the expression of positive and esteem-enhancing emotions. But such expectations do not appear to stem from efforts by the formal organization to increase sales.

REANALYSIS OF THE QUANTITATIVE DATA: TESTING THE REVISED THEORETICAL PERSPECTIVE

The revised theoretical perspective presented above provided considerable guidance for reanalysis of the quantitative data. A comparison of busy and slow times facilitated interpretation of the qualitative data. It appeared that stores with a high proportion of busy times were less likely to have a set of clerks who displayed positive emotions to customers and that stores with a low proportion of busy times were more likely to have a set of clerks who did display good cheer to customers. Stores could be placed on a continuum from rapidly to slowly paced. Thus, we proposed that clerks working in a store that was usually busy would be guided less frequently by norms supporting the display of positive emotions. We came to view store pace—time pressure placed on clerks and customers—as cause of displayed emotion. Thus, although the display of positive emotion was a predictor variable in the initial analysis of the quantitative data, our revised perspective suggested that it be used as the criterion variable.

The revised perspective also suggested that we use two indicators of store pace—store sales and line length—as the predictor variables. Compared to stores with low sales, stores with high sales have more customers, more vendors coming and going, more telephone calls, and more people playing video games. Thus, stores with high sales have a high proportion of busy times. Furthermore, busy stores usually have longer lines than slow stores.

Thus, average line length, one of the control variables used in the initial analysis, also indicates how much objective and subjective time pressure is usually placed on clerks and customers in a store.

Table 1 presents a modest positive relationship between sales and line length. But the small magnitude of that correlation, along with findings based on our observations of the stores, suggested that line length is a distinct indicator of store pace. High store sales may reflect large purchases rather than long lines. Moreover, stores with high sales place other demands on clerks that line length does not reflect, such as more frequent visits by vendors and more pressure to restock shelves.

In short, we proposed that stores with a high proportion of busy times would be less likely to have clerks who greeted, smiled at, established eye contact with, and said "thank you" to customers. Specifically, we expected that (1) store sales would be negatively related to the expression of positive emotion and (2) a store's average line length would be negatively related to the expression of positive emotion.

These expectations were tested in the same data set used for the first quantitative analyses; multiple regression analyses were again used in the sample of 576 stores. A hierarchical procedure similar to that used in the first quantitative analysis was employed. The first equation included seven control variables—ownership, supervision costs, stock level, customers' gender composition, clerks' gender composition, clerks' image, and region—as predictors of the display of positive emotion. This analysis yielded a multiple R of .40 and an adjusted R-square of .15 ($p < .001$). In the second equation, we added the predictor variables of line length and total store sales to the seven control variables used in the first equation. Table 4 presents the results of this equation; a multiple R of .44 and an adjusted R-square of .18 were obtained. Table 4 indicates that both store sales and average line length were significantly and negatively related to the display of positive emotion. The significant beta weights for both total store sales and average line length indicate that these variables make a significant contribution to the variance explained by the model. That is, the increment in R-square is statistically significant. These results support our revised perspective.[1]

Several control variables were also significantly related to the display of positive emotion: store ownership, stock level, clerks' gender composition, and region. Clerks in corporation-owned stores presented positive emotions more often than clerks in franchised stores. This finding may occur because executives can enforce policies about emotional expression in corporate stores but can only encourage such behavior in franchised stores. Stock level was positively related to pleasant displays; both maintaining well-stocked shelves and displaying good cheer may reflect general adherence to corporate guidelines. The positive relationship between clerks' gender composition and expressed positive emotions is consistent with prior findings that women are more likely to smile and display warmth than men (Deaux, 1985). Finally, as Table 4 shows, two of the three dummy-coded region variables had significant beta weights. A comparison of means (Pedhauzer, 1982: 289) for the regions indicated that clerks in the West were the most likely to express positive emotions and clerks in the Northeast were the least likely to do so. The negative relationship shown in Table 4 between the two indicators of store pace and the expression of positive emotion are consistent with our revised perspective. A key underlying assertion of this perspective is that clerks are less likely to display positive emotions during busy times than during slow times.

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[1] We also conducted additional analyses to rule out nonlinear relationships between total store sales and displayed emotion and between line length and displayed emotion. An argument based on activation theory (Scott, 1966) suggested that, if store pace was a stressor and decrement in displayed positive emotion was a form of on-the-job performance, there would be an inverted-U-shaped relationship between store pace and the display of positive emotion. We used multiple regression analyses with quadratic (X^2) terms of store sales and line length to explore that hypothesis (Cohen & Cohen, 1975). The squared variable did not bear a significant relationship to displayed emotion ($p < .10$) in either of the analyses. Thus, we found no support for a U-shaped or an inverted-U-shaped relationship between sales and displayed emotion or between line length and displayed emotion.

Further evidence for this assertion was obtained by comparing clerks' behavior during busy and slow times. The line-length variable, which was gathered at the clerk level of analysis, is an indicator of store pace at a given

TABLE 4
Results of Regression Analysis of Store Pace as a Predictor of Display of Positive Emotion[a]

Variables[b]	Betas
Control variables	
Store ownership	−.14†
Supervision costs	.01
Stock level	.23**
Customers' gender composition	.04
Clerks' gender composition	.15**
Clerks' image	.06
Region 1	−.03
Region 2	.25*
Region 3	.12**
Store pace	
Total store sales	−.09*
Average line length	−.20**
Multiple R = .44	
Adjusted R-square = .18**	

[a] $n = 576$.

[b] Store ownership was coded 0 for corporation-owned stores and 1 for franchised stores. Customers' gender composition is the proportion of woman customers. Clerks' gender composition is the proportion of woman sales clerks. Region 1, region 2, and region 3 are dummy codes representing the four regions.

†$p < .10$, two-tailed test.

*$p < .05$, two-tailed test.

**$p < .01$, two-tailed test.

time. If norms about expressed emotions were linked to pace in the convenience stores studied, we expected that, across the 1,319 clerks who were observed for this study, there would be a negative relationship between the length of the line a clerk faced and his or her display of positive emotions.

A hierarchical multiple regression procedure at the individual level of analysis confirmed that expectation. We introduced the relevant control variables into the first equation: clerks' gender composition, proportion of woman customers, clerks' image, and store's stock level during the observation. This analysis yielded an *R* of .27 and an adjusted *R*-square of .07. In the second equation, we added average line length as an additional predictor. Line length was significantly and negatively related to the display of positive emotion by clerks (beta = $-.14$, $p < .001$, $n = 1{,}319$). The complete model yielded an *R* of .32 and an adjusted *R*-square of .10

These analyses did not, however, address the question of whether constant exposure to busy or slow times influences all transactions in a store regardless of whether a particular time happens to be slow or busy. If recurring pace does influence store norms about expressive behavior, the relationship between line length and the display of positive emotion is likely to be different in typically busy stores than in typically slow stores.

The qualitative evidence led us to expect that clerks in stores that are usually busy will be less sensitive to the number of customers standing in line than clerks in stores that are usually slow. During slow times in typically busy stores, clerks may be indifferent or even unhappy about seeing customers because they must use slow times to cope with other demands such as stocking shelves, dealing with vendors, and answering phone calls. But such distracting demands are lower in stores that are typically slow. During slow times in stores that are usually slow, clerks are more likely to offer good cheer because they are bored and need the entertainment provided by customers.

In addition, we proposed that clerks in stores that are usually slow are less likely to offer pleasant emotions during busy times than clerks in stores that are usually busy. Clerks in stores that are usually slow have less experience in coping with the pressure of busy times. Thus, clerks in stores that are usually slow may be more likely to feel and thus express neutral, or even negative, feelings when lines do get long.

Thus, we expected a stronger negative relationship between the line lengths faced by individual clerks and their display of positive emotion in stores that are usually slow than in stores that are usually busy. Store sales is an indicator of whether a store is typically busy or slow. The expected relationship implies a significant interaction effect at the individual level of analysis between the length of a line that clerks face and the level of total sales of the store in which they work. We expected that interaction to have a significant effect on the display of positive emotion by clerks. Thus, an additional regression equation was examined. In this equation, the interaction term (line length × total sales) was included, in addition to the individual-level control variables—clerks' gender composition, customers' gender composition, clerks' image, and store's stock level during the observation. As expected, the interaction term bore a significant relationship to displayed positive emotion (beta = $-.07$, $p < .001$), and the equation yielded a multiple R of .29 and an adjusted R-square of .08, compared to a multiple R of .27 and an adjusted R-squared of .07 obtained with the model including only the control variables.

Subgroup analyses were conducted in order to understand the pattern of this interaction. Specifically, we split the sample of 576 stores at the mean of store sales, classifying 326 stores as slow and 250 stores as busy. We then conducted multiple regression analyses within each subsample on the relationship between line length and the expression of positive emotion by individual clerks.

As with the other multiple regressions at the clerk level of analysis, we first introduced clerks' gender, customers' gender, clerks' image, and store's stock level as control variables. Line length was then introduced as the predictor variable. The display of positive emotion by clerks was the criterion variable. In slow stores, the relationship between line length and the display of positive emotions was negative and significant (beta = $-.19$, $p < .001$, $n = 708$ clerks). In busy stores, that relationship was not nearly as strong and was only marginally significant (beta = $-.06$, $p < .10$, $n = 611$ clerks). Those results affirm that there is a stronger negative relationship between line length and the display of positive emotion by individual clerks in typically slow stores than in typically busy stores. We repeated this analysis with the sample split at the median of store sales and observed the same pattern of results.

DISCUSSION

Our initial conceptual perspective focused on expressed positive emotions as control moves that influence the shopping behavior of customers. We hypothesized that stores in which employees were more likely of offer positive emotions to customers would have greater sales. But a quantitative study of 576 convenience stores revealed a negative relationship between diplayed positive emotions and store sales.

Our revised perspective emphasized that store sales reflect store pace and that store pace is a cause, rather than an effect, of expressed emotions. We found some empirical support for the revised perspective. But our sample included only one variety of convenience stores; the service ideal associated with these stores has not traditionally included friendly service. Emotions expressed in organizations in which a different service ideal is present may act as control moves that influence sales. That is, a warm emotional front may promote sales when customers expect that it should and will be a central part of a firm's service. Examples of organizations where customers expect to receive good cheer from employees include Nordstrom's (Peters & Austin, 1985), Disneyworld (Tyler & Nathan, 1985), and Delta Airlines (Hochschild, 1983). Furthermore, expectations of fast service need not exclude warmth and friendliness; McDonald's is an example of a national chain in which the service ideal includes both rapid and friendly service.

The convenience stores studied are settings in which transactions between employees and customers are very brief. Expressed emotions may also be more powerful control moves during long transactions between employees and customers. When waiters serve customers in restaurants, for example, the interaction may last anywhere from 30 minutes to one and a half hours (Mars & Nicod, 1984), far longer than the 2 or 3 minutes that a typical customer spends in the stores we studied. There is more time during a long transaction for the customer to notice and react to the emotional behavior of an employee; thus, the operant conditioning cycle we discussed earlier is more likely to become established.

Our initial conceptual perspective had a far different focus than our revised perspective. The initial perspective emphasized control moves and corporate display rules. The revised perspective emphasized store pace, widely held norms for convenience settings, and employees' inner feelings. Nonetheless, some integration of those two perspectives on the expression of emotion in organizational life may have benefits for both organizational theory and managerial practice.

First, the qualitative evidence suggested that the concept of control moves might still be useful for understanding the convenience stores we studied but that future research might benefit from considering how expressed emotions influence variables other than sales volume. Evidence about busy times suggested that an emotionally neutral demeanor discouraged customers from initiating extended conversations. Presenting a neutral demeanor can act as a control move because it helps clerks influence the behavior of their customers and thus helps clerks provide fast service. Further, evidence about slow times suggested that pleasant displays can encourage customers to engage in conversations that are an important source of variety in a boring job. Thus, the display of good cheer during slow times may be a control move that promotes individual rather than organizational goals.

Second, organizational theorists have not extensively studied the emotions displayed by organizational members (Hochschild, 1983; Rafaeli & Sutton, 1987). One central question for this emerging area is the extent to which leaders can prescribe employees' expressive behavior. Our initial perspective emphasized emotions expressed on the job as the outcome of corporate practices. But our revised perspective emphasizes that, although corporate display rules do constrain displayed emotions, store norms and inner feelings can sometimes be a more powerful influence over such behavior.

One combination of the initial and revised perspectives has direct implications for managers who want to design jobs so that subordinates who work in busy settings will be pleasant towards customers. Organizational norms specifying the display of good cheer to customers may be easier to enforce if managers take steps to reduce the objective and subjective stress placed on employees and customers. For example, the introduction of a single line for multiple clerks may reduce the perceived pressure on both employees and customers in busy environments. The physical distance between clerks and customers waiting in line may act as a buffer; clerks can offer polite and friendly service to the customer they are serving without risking sanctions from other customers. The single-line system with multiple clerks also reduces customer anxiety about having chosen the fastest clerk and discourages customers from focusing anger and irritation on any single clerk.

In closing, we would like to return to the methods used in this study. The observational methods used here are not widely employed in organizational research. Thus, questions may arise about whether it is ethical to secretly observe employees. Procedures used in the present research were, however, consistent with ethical guidelines on the conduct of nonreactive research and contrived observations (Salancik, 1979; Sechrest & Phillips, 1979; Webb et al., 1981). The American Psychological Association discourages "covert investigations in private places" (American Psychological Association, 1973: 13). The convenience stores used in the present research are, however, public places. Moreover, the corporation's use of incognito observers and our own use of that method during the qualitative phase were only partly covert. Although specific, informed consent was not obtained from each clerk observed, all clerks had been informed that encounters with mystery shoppers were part of the job: the corporate training program explained the use of mystery shoppers and the expected expressive behaviors. Furthermore, the names of individual clerks were not recorded in either the quantitative research conducted by the corporation or in our own qualitative research. Thus, in terms of a harms-benefit analysis, such data were not, and could not, be used to harm any individual clerk.

Finally, we learned much about the role of expressed emotion in organizational life from this research because it entailed two complete cycles of induction and deduction. Unfortunately, however, it is not normative in the organizational studies literature, nor in other scholarly areas, to report unsuccessful efforts at induction or deduction. Studies that find no significant relationships are usually not published. Moreover, we occasionally hear of studies in which the findings contradict initial hypotheses but that are written as if the unexpected results were predicted at the outset of the investigation. The tendency to report only successful predictions persists even though failed predictions offer important lessons about the research process and about organizational life (Mirvis & Berg, 1977). We hope that, in some small way, this research is a step toward changing those norms.

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APPENDIX

Guide for Semistructured Interviews with Store Managers

1. How long have you been the manager of this store?
2. Why did you become a store manager?
3. Have you worked at the cash register in this store? (Prompts: How frequently? In another store?)
4. What qualities do you look for in selecting employees?
5. What sort of training do employees get? (Prompts: From the store? From the corporation?)
6. How are employees rewarded? (Prompts: How much pay? Anything other than pay? From the corporation? From the store?)

7. Do employees act differently when the store is busy? When the store is not busy?
8. Do customers act differently when the store is busy? When the store is not busy?
9. What do difficult customers do to make the clerk's work difficult? Tell me about a time when a really difficult customer entered the store. What are examples of good management of such customers? What are examples of bad management of such customers?
10. Is there anything special you tell employees about handling difficult customers?
11. Do you think there is a relationship between sales and courtesy?
12. What do you think of the corporation's push for courtesy?
13. What things do you do as a store manager to affect employee courtesy?
14. Is there any special employee training that emphasizes courtesy?
15. What do you think influences how courteous employees are?
16. Have you ever fired anyone for being rude to a customer?
17. In closing, are there any other important issues that we should have mentioned, but have not?

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AGENCY- AND INSTITUTIONAL-THEORY EXPLANATIONS: THE CASE OF RETAIL SALES COMPENSATION

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This research evaluated when organizations use salary compensation and when they use compensation that is based on performance. Variables from agency- and institutional-theory perspectives were used to explore the sales-compensation policies of 54 retail specialty stores. The programmability of a job, span of control, uncertainty, type of merchandise, and the age of a store chain were strong predictors of compensation policy. Overall, the results suggest that both perspectives are necessary for a good description of compensation policies.

The assumption that compensation should be tied to performance is widespread throughout the organizational literature (e.g., Lawler, 1971; Lawler, 1981; Pearce, Stevenson, & Perry, 1985; Ungson & Steers, 1984). Performance-based compensation plans hold the promise of increasing the motivation and retention of top employees (Dyer & Schwab, 1982). However, as several authors have observed (Loomis, 1982; Pearce et al., 1985; Redling, 1981), compensation based on performance is less widespread in practice than in theory.

Despite the importance of performance-contingent compensation in the organizational literature (e.g., Pearce et al., 1985; Ungson & Steers, 1984), there are few studies on the question of when firms actually use it. Most of those studies have focused on the compensation of senior executives in the largest U.S. corporations. For example, Pitts (1974) found that companies formed via aquisition were likely to use outcome-based compensation for senior executives. Lorsch and Allen (1973) found that conglomerates were more likely than less diversified firms to use quantified output measures for performance evaluation of executives. Gomez-Meija, Tosi, and Hinkin (1987) found that the compensation of the chief executive officers of very large manufacturing firms was closely related to firm performance in firms with dominant stockholders. Although those findings are interesting, there is a need for a broad theoretical framework that would permit generalization to other compensation situations.

Two theoretical viewpoints show promise for providing that framework. One of these is agency theory (Fama & Jensen, 1983; Jensen & Meckling,

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1976). Agency theory was developed in the information economics literature to model the relationship between one party (the principal) who delegates work to another (the agent). It extended the organizational control literature (Ouchi, 1980; Pennings & Woiceshyn, 1986; Thompson, 1967), bringing in ideas on compensation, risk, and information systems (Eisenhardt, 1985, 1989), and has also been applied, through mathematical modeling, to compensation (Basu, Lal, Srinivasan, & Staelin, 1985).

Consistent with the traditional literature on compensation (e.g., Babchuk & Goode, 1951; Lawler, 1971; Lawler, 1981; Sibson, 1974), agency theory emphasizes the need for measurability of performance and for performance criteria that employees can influence. What agency theory adds is a more precise statement of concepts and theory. In comparison with previous literature, agency theory draws a much clearer distinction between behaviors and outcomes and clarifies the importance of that distinction for compensation choice. It also sharpens the concept of measurability by distinguishing between measurability inherent in the nature of a job and measurability due to information systems. Third, agency theory takes a sharper view of risk by emphasizing risk-reward trade-offs rather than simply the negative aspects of risk (Lawler, 1981). Overall, agency theory pushes the traditional view of compensation toward clearer concepts, more testable hypotheses, and an overall theory.

A second theoretical viewpoint is institutional theory (Meyer & Rowan, 1977; Zucker, 1987), which suggests that firm managers look to industry norms, firm traditions, management fads, and so on to formulate compensation policies. Those policies are then resistant to change even in the face of major changes in job content and technology. Although the institutional approach has not been brought to bear on compensation in prior research, there is persuasive evidence for institutional explanations in other areas of administrative practice (Rowan, 1982; Tolbert & Zucker, 1983). For example, Tolbert and Zucker tied the introduction of civil service reform to institutional forces. Institutional explanations are also consistent with the use of rules of thumb, which is frequent in compensation practice. For example, writing about executive compensation, Hay Associates (1979) stated that utility firms pay small bonuses. Writing on sales compensation, Smyth (1968) and Anderson and Oliver (1986) described how many firms rely on various industry norms and other rules of thumb in setting their compensation policies.

The purpose of this study was to explore when firms use salary compensation and when they use compensation with a substantial commission component. The empirical setting was retail sales. Retailing is a major industry in the United States (Bluestone, Hanna, Kuhn, & Moore, 1981). Salesforce compensation is a major cost in the industry, and firms explicitly choose between salary plans in which salespeople's pay is more or less assured and commission plans in which a substantial portion of pay depends on individual sales performance (Redinbaugh, 1976).

The research design used variables from both the agency- and institutional-theory perspectives. The design juxtaposes the two types of variables but does not test one set against the other. As several authors (Allison, 1971; Feyerabend, 1981; Kuhn, 1970) have argued, multiple perspectives contribute to robustness in explaining a phenomenon by emphasizing complementary facets.

The study's contribution to the compensation literature is taking a modest empirical look at when firms use performance-contingent pay. It used a more conceptual approach than many prior studies, highlighting agency and institutional variables that are new to the empirical literature on compensation, and data that moves beyond the compensation of senior executives in major corporations. The study's contribution to organizational theory is its juxtaposition of variables from two very different perspectives (Astley & Van de Ven, 1983), each of which has received considerable attention in its base discipline (economics and sociology), but little empirical study.

AGENCY THEORY

Agency theory (Fama & Jensen, 1983; Jensen & Meckling, 1976; Ross, 1973) is directed at a particular type of organizing problem, the so-called agency problem. It models the relationship between a principal who delegates work to an agent who performs that work. Agency theory attempts to describe that relationship using the metaphor of a contract (Keeley, 1980). The focus is on determining the optimal contract that governs the relationship between a principal and an agent. Specifically, when is it more efficient to have a contract based on behavior versus a contract at least partially based on outcomes? Table 1 summarizes the key ideas of agency theory.

Agency theory is usually described in terms of cases (Demski & Feltham, 1978). In the first case, a principal knows what an agent has done (Eisenhardt, 1985). Since the principal is buying the agent's behaviors, a contract based on behavior is most efficient. A contract partially based on outcomes would needlessly transfer risk.

In the second case, the principal does not know what the agent has done. A self-interested agent may or may not have performed as agreed. The principal has two options (Demski & Feltham, 1978): (1) to discover the agent's behavior by investing in information or (2) to contract at least partially on the basis of the outcomes of the agent's behavior. Such a contract motivates behavior by aligning the agent's preferences with those of the principal, but at the price of transferring risk to the agent. The issue of risk arises because outcomes are only partially a function of behaviors. Government policies, economic climate, competitors' actions, the weather, and other factors may intervene to cause variations in outcomes. Such uncertainty introduces not only inability to plan but also financial risk.

The choice between a contract based solely on behavior and one partially based on outcomes depends on the trade-off between the cost of measuring behavior and the cost of transferring risk to the agent through a contract partially based on outcomes (Demski & Feltham, 1978). If it is relatively

TABLE 1
Comparison of Agency and Institutional Theories

	Agency Theory	Institutional Theory
Key idea	Organizational practices arise from efficient organization of information and risk-bearing costs	Organizational practices arise from imitative forces and firm traditions
Basis of organization	Efficiency	Legitimacy
View of people	Self-interested rationalists	Legitimacy-seeking satisficers
Role of environment	Organizational practices should fit environment	A source of practices to which organization conforms
Role of technology	Organizational practices should fit technology employed	Technology moderates the impact of institutional factors or can be determined institutionally
Problem domain	Control problems (vertical integration, compensation, regulation)	Organizational practices, in general
Independent variables	Outcome uncertainty, span of control, programmability	Industry traditions, legislation, social and political beliefs, founding conditions that comprise the institutional context
Assumptions	People are self-interested People are rational People are risk-averse	People satisfice People conform to external norms

inexpensive to monitor behavior or expensive to place risk on the agent, a contract based solely on behavior is most efficient.

The agency problem structure can be applied in a variety of settings. One example is the employment relationship. Consider the case of a manufacturing plant manager. Agency theory is concerned with (1) whether the plant manager should be evaluated on the basis of units produced, MBO goals, plant profits, or other goals and (2) how the plant manager should be rewarded. Another example is executive compensation. Should a firm use straight salary, stock options, or bonuses based on profitability? Agency theory can also be applied to vertical integration relationships (Eccles, 1985), budgeting (Demski & Feltham, 1978), and interorganizational relationships (Wolfson, 1985).

Agency theory extends efficiency theories such as those concerning structural contingencies and transaction costs in several ways. One is the treatment of information. Information is regarded as a commodity that has a cost and can be purchased. Those characteristics give an important role to formal information systems, like those used in budgeting, and to informal information systems, like those used in supervision. The result is a dynamic view of information that is unique in organizational theory. Agency theory also extends efficiency theories by pushing the ramifications of uncertainty to their implications for creating risk. In agency theory, uncertainty is viewed as it is in economics, accounting, and finance—in terms of risk-reward trade-offs—and not just as a hindrance to planning. Finally, the theory contributes by emphasizing a political view of organizations. Organizations are viewed as collectives of self-interested people with partially conflicting goals. In approaches like resource dependency, goal conflicts are resolved through use of power. In agency theory, they are resolved through alignment of goals through the use of incentives.

In summary, agency theory emphasizes the degree to which contracting issues such as compensation depend on a trade-off between the costs of evaluating behavior and the costs of bearing risk.

INSTITUTIONALIZATION THEORY

From the institutional perspective, organizations are the way they are for no other reason than that the way they are is the legitimate way to organize (Meyer & Rowan, 1977; Zucker, 1987). The key idea behind institutionalization is that much organizational action reflects a pattern of doing things that evolves over time and becomes legitimated within an organization and an environment (Pfeffer, 1982). Therefore, it is possible to predict practices within organizations from perceptions of legitimate behavior derived from cultural values, industry tradition, firm history, popular management folklore, and the like. Things are done in a certain way simply because it has become the only acceptable way of doing them (Zucker, 1977). Table 1 summarizes key points of the institutional perspective.

Much of the institutional literature emphasizes that organizational structures and processes tend to become isomorphic with the accepted norms for organizations of particular types (DiMaggio & Powell, 1983). In effect, an environment legitimates certain ways of organizing. For example, Tolbert and Zucker (1983) found that over time, civil service reform was adopted because it became symbolic of good government rather than because it was efficient. Rowan (1982) obtained similar results in his study of the diffusion of school health, psychology, and curriculum programs in California public schools. In a similar vein, Kaplan (1984) described the institutionalization of accounting practices, arguing that many current internal accounting practices were developed in the 1930s from external reporting requirements for firms manufacturing stable products with a high direct labor content. Despite the lack of fit between such techniques as standard variance analysis and cost allocation practices and the needs of many firms today, those practices have become the legitimate way to report information.

Consistent with the institutional perspective, although not a usual institutional argument, is the idea that structures and processes also tend to become isomorphic with contextual conditions that existed at the time of organizational founding. New firms adopt practices common at their time of founding. In this way, as Stinchcombe (1965) argued, organizations are "imprinted" at their birth. Over time, those practices become the standard way of doing things in the organizations. The effects of founding context have been noted in fraternities (Stinchcombe, 1965) and in sheltered workshops (Kimberly, 1975).

Institutionalization occurs in part because people conform to taken-for-granted ways of doing things (Pfeffer, 1982). Such standard ways of doing things allow people to focus on new problems and to rely on experience for issues that are not pressing (Cyert & March, 1963). Moreover, organizational structures and processes become part of an integrated whole in which it is difficult to change any part without unraveling the whole (Clark, 1972). However, these arguments do not imply that institutional choices are necessarily irrational. Rather, the use of structures and processes that are legitimated by an environment can be sensible because it implies responsible management, pleases external others, and avoids potential claims of negligence if something goes wrong (Meyer & Rowan, 1977).

AGENCY-THEORY HYPOTHESES

From an agency-theory viewpoint, the choice between salary compensation and compensation with a substantial commission component depends on whether employee behaviors can be readily evaluated. One factor that influences behavior evaluation is the programmability of a job (Eisenhardt, 1985). Programmed jobs are ones in which behaviors can be precisely defined. As Bowen and Jones (1986) concluded, the amount of service in a selling process affects the programmability of service jobs like retail selling. In retail selling, a highly programmed job is one that consists primarily of cashiering. The job requires a small set of well-defined behaviors, such as being punctual and properly operating the register, which are easy to evaluate. In contrast, a selling job with low programming requires extensive personal selling. In such a job, although it is still important in most situations to cashier properly and to be on time for work, less well-defined behaviors are more important. Can the salesperson develop rapport with customers, describe product features, and know when and how to close a sale? That type of behavior is much more difficult to evaluate than the behavior needed in a highly programmed job.

The link between ease of evaluation and compensation is straightforward. Given that people are hired to perform behaviors, if behaviors can be evaluated, it makes sense for stores to pay directly for those behaviors via salaries. Commissions simply make people dependent on outcomes that they only partially control, and such risk bearing is the role of owners (Fama & Jensen, 1983). On the other hand, if behaviors cannot be readily evaluated, commissions are attractive because they align the goals of salespeople with those of the store in which they work. Thus, commissions motivate salespeople to behave in the interests of the store even though their actual behaviors are not well evaluated by store management. In sum, when it is easy to evaluate behaviors, stores will use salaries, but when behaviors are difficult to evaluate, they will use commissions.

> *Hypothesis 1: Job programmability is positively related to the use of salaries and negatively related to the use of commissions.*

A second factor that influences the ease with which employee behaviors are known is managerial span of control. In the case of retailing, managers learn about employee behavior primarily through informal supervision (Redinbaugh, 1976). Thus, when their span of control is low, store managers can maintain close supervision and have good information upon which to evaluate employee behavior. In effect, a low span of control is a way of investing in information about what employees are doing. Having made such an investment, a store will prefer salaries because, when behavior is well known, there is no need to use commissions to bypass the evaluation of behavior. Store management can observe and motivate behavior directly.

> *Hypothesis 2: Span of control will be negatively related to the use of salaries and positively related to the use of commissions.*

In addition to the ease with which behaviors can be evaluated, the riskiness of a business also affects compensation. Commissions motivate behavior but in the process transfer risk to salespeople. High uncertainty puts salespeople on commission at high financial risk.

Although it may seem attractive for retail firms to transfer the risk associated with high outcome uncertainty to commissioned salespeople, several factors often militate against actually doing so. First, the purpose of commissions is motivation. To use them for risk sharing is to confound their purpose. Risk sharing is better accomplished through organization-wide plans like profit sharing. Second, commissions work in both directions: they improve profits in bad times, but they lower profits in good times. To view commissions only as a way to soften bad times is to neglect their negative effects on firm profits in good times. A third and related point is that outcome uncertainty is more than an inability to plan. Uncertainty creates risk and associated risk-reward trade-offs. Thus, just as in the stock market and gambling, high risks require high rewards. Commissioned salespeople, who face high outcome uncertainty, usually receive high pay because of the risk that they assume (Bluestone et al., 1981). Fourth, using commissions when outcome uncertainty rises damages employee morale, as people feel that they are not responsible for their own pay (Lawler, 1981). Salespeople, especially top performers, may leave. In contrast, organizations can typically diversify their risk more than individuals can, and thus it is easier and less costly for organizations to assume risk (Fama & Jensen, 1983). Thus, from an agency viewpoint, when outcome uncertainty is high, commissions are very risky for employees and thus, unattractive to retailers.

> *Hypothesis 3: Outcome uncertainty will be positively related to the use of salaries and negatively related to the use of commissions.*

When a job is relatively highly programmed, behaviors are easily verified and salaries are the compensation choice. Moreover, a high level of information is unnecessary because behaviors are readily observable, and outcome uncertainty is irrelevant because commissions are not even considered. However, when programmability is low, the story changes: information and commissions are the two options through which managers can overcome the problems of evaluating behavior.

> *Hypothesis 4: Span of control and outcome uncertainty are more important predictors of compensation policy when job programmability is low than when it is high.*

INSTITUTIONAL-THEORY HYPOTHESES

Institutional explanations of compensation policies depend on understanding industry and firm traditions. As DiMaggio and Powell (1983) noted, institutional hypotheses are not defined a priori, but rather in terms of the empirical context under study. Therefore, the development of institutional hypotheses for this study required understanding the history of retail compensation (Rowan, 1982; Tolbert & Zucker, 1983). This history was developed from several secondary sources (Bluestone et al., 1981; Harrington, 1962; Lowry, 1969).

Prior to the 1930s, retailing was concentrated in the hands of small operators who owned their own stores (Lowry, 1969). One of the first major changes in that pattern was the introduction of the department store concept, during the 1930s. The concept included maintaining a dominant center city store and a small number of satellite stores (Harrington, 1962). According to Harrington's description, at this time retail selling had fairly high status, the jobs were full-time and relatively well paid, and consistent with the Tayloristic philosophy[1] of the times, commissions were commonplace.

Department stores became the focus of union-organizing activities in the late 1930s (Harrington, 1962). Center city stores were an attractive organizing target because they employed large numbers of people under one roof. In contrast with many industrial unions, the retail union emphasis was then and is now on the preservation of the professional status of the retail salesperson. In the union view, that status included receiving commissions as a just share of profits (Bluestone et al., 1981; Harrington, 1962).

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[1] The work of Frederick Taylor (1911), which enjoyed widespread popularity, stressed the breakdown of work and incentive pay. In particular, incentive pay was envisioned by Taylor as the appropriate reward to labor for increased productivity resulting from the scientific design of work. Moreover, Taylor stressed the importance of incentive pay to reward most highly those individual workers who contributed most to the productivity improvements. For further discussion, see Perrow (1986: 53–58).

Several changes in the 1950s affected retail sales compensation. One was the popularization in the business world of humanistic approaches to motivation (Herzberg, Mausner, & Snyderman, 1959; McGregor, 1960; Maslow, 1954). One aspect of the new philosophy was a deemphasis on extrinsic rewards like commissions (Herzberg et al., 1959). Piece-rate pay and commissions became associated with a "theory X" attitude toward employees, and salaries became associated with higher, white-collar status and the more modern "theory Y" attitude (McGregor, 1960). Thus, during the 1950s commissions began to go out of style in U.S. businesses.

At the same time, factors specific to retailing also affected retail compensation. In the 1950s, retailing activity moved away from the center cities into suburban shopping centers and retailing became increasingly concentrated in national holding companies like Federated Department Stores and national store chains like Sears, Roebuck and Company (Lowry, 1969). The effect of those changes was that retailers became more powerful and retail unions lost ground (Lowry, 1969) because the shift to numerous suburban locations made the union-organizing task much more difficult (Bluestone et al., 1981). Although the overall number of people employed in retailing grew, the number concentrated in single locations under a single management declined. The retail workforce also became more transient and part-time and therefore difficult to organize. The decline of union power in retailing is germane to this study because retail unions were a principal proponent of commissions. Retailers often preferred salaries, which they perceived as less costly to administer and more consistent with the new humanistic motivational philosophy (Bluestone et al., 1981).

The net present-day effect of the change in motivational philosophy, the decentralization of retail activity, and the decline of unions is that older stores are more likely to use commissions and newer ones are more likely to use salaries. In theoretical terms, the institutional environment has changed over time from a commission to a salary orientation and thus created differences in the founding contexts of stores.

> *Hypothesis 5: The age of a store will be negatively related to the use of salaries and positively related to the use of commissions.*

Although the overall trend in retail compensation has been away from commissions, there are still segments of the industry in which commissions remain the traditional form of compensation. One such segment is shoe stores. The tradition has its roots in the rise of department stores, which were most often formed by merging multiple specialty shops under one roof (Bluestone et al., 1981). Clothing sales was the backbone of the early department stores. As department store owners expanded their range of merchandise beyond clothing, they frequently leased space to independent suppliers of other merchandise (Lowry, 1969), a practice that allowed expansion with little investment. Shoes were frequently a first step because they are a natural accessory to clothing. As lessees, shoe salespeople had incomes related to their sales (Lowry, 1969). Over time, shoe salespeople became department store employees, but the tradition of pay based on sales continued through the use of commissions. By the 1950s, although department stores had begun to decline, the tradition of selling shoes by commission was firmly established in retailing (Redinbaugh, 1976).

> *Hypothesis 6: The use of commissions will be more common in shoe sales than in other types of retailing.*

The other segment of retailing in which commissions dominate is the selling of high-priced merchandise (Redinbaugh, 1976), a tradition that also has its roots in early department stores. In those stores, retail selling was organized into commission tiers (Bluestone et al., 1981), with different percentages paid for selling different types of merchandise. The highest tiers were associated with the highest-priced merchandise because selling it was considered more difficult. Selling such merchandise was also more lucrative for good salespeople than selling low-priced items and, therefore, more prestigious (Bluestone et al., 1981). The very best salespeople moved up to the highest commission tiers. As retail compensation in department stores moved toward salaries, the greatest opposition came from the best salespeople, who had the most to lose (Bluestone et al., 1981). In many cases, department store managers left the high-tier commission structure intact rather than lose those people. Although department stores no longer dominate retailing, some evidence suggests that the tradition of selling high-priced merchandise by commission remains (Redinbaugh, 1976).

> *Hypothesis 7: Purchase size will be negatively related to the use of salaries and positively related to the use of commissions.*

METHODS

Data Collection

Data were collected from 54 specialty stores in a suburban Bay Area shopping center. I used a single shopping center to control extraneous sources of variation such as differences in labor and consumer pools. Specialty stores were operationally defined as having less than 8,000 square feet of selling space, a definition that eliminated major department stores. All stores were contacted through their manager. After two follow-up letters, 54 of 85 store managers agreed to participate in the study.

The stores were small in terms of both physical size (mean selling space = 2,014 sq. ft., s.d. = 1,428) and number of employees (mean = 8.1, s.d. = 3.5). The typical store had one store manager and possibly one, two, or three assistant managers. Some stores were parts of chains, the largest of which included 948 stores nationwide (mean = 155); others were single local stores. The salespeople were young (mean age = 25.3, s.d. = 6.7) and included men and women (mean percent of women = 40, s.d. = 33%). Turnover was high. Part-time employment was common, and promotion was not. The stores represented a range of merchandise categories, including women's and men's wear, cameras, shoes, toys, and sporting goods.

Data collection used multiple methods and informants. The principal instrument was a questionnaire developed from interviews with retailers and retail salespeople from a second, nearby shopping center, union business agents, and personnel specialists from Bay Area department stores. I pretested the questionnaire for clarity and relevance at a third shopping center. The questions were relatively objective and specific to retailing in order to enhance measurement accuracy.

Store managers were the principal informants because they were both knowledgeable and accessible. When secondary informants were available, I used them for the programmability construct because answering the relevant questions required somewhat subjective judgments. A snowballing procedure, in which a store manager nominated two salespeople to be informants, was used. There were 21 three-informant, 22 two-informant, and 11 single-informant stores.

Borrowing from Mintzberg's (1979: 587–588) "direct research" approach, I also gathered qualitative data to enrich insights into the quantitative results. Using open-ended questionnaire items, I asked store managers to explain the pros and cons of commissions and salaries at their store. Second, I had unstructured conversations with many of the store managers about compensation and managing in retailing. Third, I interviewed three store managers for approximately two hours each on how to manage and pay retail salespeople. Although the qualitative data are only a supplement to the quantitative data, I was able to use them to develop a better understanding of how retailers think about managing and pay.

Secondary data sources were used for the outcome uncertainty construct and for determining whether a store was a shoe store. I collected the data in 1980–81.

Measures

Multiple measures were used for the constructs measuring programmability, span of control, and outcome uncertainty. The measures were tested for unidimensionality and internal consistency. Since the remaining constructs could be measured accurately without multiple measures, I used single measures. The Appendix contains details about measurement testing and gives specific items.

The programmability measures focus on the technology of the jobs in question (Argote, 1982; Leatt & Schneck, 1981), specifically, on the amount of service in the selling process. Programmability was measured using four questionnaire items and multiple respondents, when available. I averaged the responses to each question made by all informants to adjust for the differing numbers of informants per store. Alpha statistics are for in-store agreement on each item. Two items, categories of selling technique and selling time, directly measured the amount of service salepeople offered at each store ($\alpha =$ .80 and .91, respectively). A third item, sales training time, related to the need for high levels of product information and selling technique with low programmability jobs (α = .94). The fourth item measured the amount of effort customers needed to expend to buy the merchandise offered, thus measuring the amount of service they desired (α = .94). I then combined the mean responses in each store for each of the four items into a single scale (α = .72). The resulting scale captured levels of programmability ranging from the very high, in which salespeople, working as cashiers, learned their job in a day or so and spent only a few minutes with each customer, to the very low, in which salespeople trained for several months and offered 30–40 minutes of continuous assistance to the average customer.

Span of control was measured in terms of the size of the space supervised and the number of employees supervised in that space (α = .82) because the information value of span of control is related to both elements. Managers who supervise a large number of salespeople in a large store cannot easily evaluate the behaviors of individual salespeople.

Outcome uncertainty is a difficult construct to assess adequately with perceptual measures (Downey, Hellriegel, & Slocum, 1975; Tosi, Aldag, & Storey, 1973). Thus, I used objective sources to determine the outcome uncertainty faced by each store. Stores were typed according to their designated line of merchandise in the shopping center directory. I then measured outcome uncertainty using failure rates reported in Dun and Bradstreet's *Survey of Retail Store Failures* for 1975 and 1979 and Census Bureau figures for the number of competitors in the San Francisco Standard Metropolitan Statistical Area for the same period for a given line of merchandise (α = .82). The outcome uncertainty measures were designed to tap the volatility dimension of uncertainty (Dess & Beard, 1984; Leblebici & Salancik, 1981), the dimension most germane to the risk implications of agency theory. The first measure, failure rate, captures downside variation, which is especially crucial in the determination of risk premiums (Kahneman & Tversky, 1979). It is also directly tied to the variance of the outcome distribution that is the essential characteristic of volatility (Leblebici & Salancik, 1981). The second measure, competition, is related to general instability in industries like retailing that have low entry barriers (Porter, 1980) and high flexibility in product and service niches (Sasser, Olsen, & Wyckoff, 1978). The resulting measures fit prevailing intuitions about uncertainty in retailing. For example, ladies' apparel was the line of merchandise with the highest outcome uncertainty.

Age was measured as the number of years of age of the store chain or of the store, for single stores. Chain age was used because type of compensation is a decision made at the chain, not store, level in retailing businesses like those studied (Lowry, 1969). Age captures a range of qualitative factors (e.g., managerial philosophy, union power) related to changes in an institutional environment over time (Bluestone et al., 1981; Harrington, 1962).

The average size of a purchase at the store was given by the store manager's response to a questionnaire item: "What is the average purchase size ($'s) in this store?"

Stores were designated as shoe stores when they appeared in the shoe-store category of the shopping center directory.

The compensation categories were drawn from the literature on retail compensation (Bluestone et al., 1981; Redinbaugh, 1976; Sibson, 1974). Although a continuous measure is possible, I used a dichotomous measure, salary versus commission.[2] Commission plans were pay plans in which at least a portion of compensation was based on sales for which an employee was personally responsible. In the stores studied, all the commission plans contained a commission component of at least 30 percent. Salary pay plans were those in which pay was exclusively through a salary or at an hourly rate.

Analyses

The hypotheses were examined using two-group discriminant analysis (Green, 1978), a technique producing a discriminant function that statistically distinguishes two groups of cases. It is an empirically robust technique (Efron, 1975; Lachenbruch, 1975; Lee & Bayus, 1985) and was particularly attractive for the number of stores studied because it has finite statistical properties. Also, its segmentation logic fits the study's dichotomous central question, when do firms use salaries versus commissions, and the coefficients and R-square values it yields are readily interpretable.[3]

RESULTS

Table 2 shows the means, standard deviations, and intercorrelations for all variables.

Agency Theory

Table 3 shows results of the discriminant analysis. For all 54 stores, the agency-theory explanation of the choice of salary or commission is statistically significant and classifies 80 percent of the cases correctly. Results also support the individual hypotheses. Job programmability is positively related to the use of salaries (Hypothesis 1). When a sales job is highly programmed, retailers use salaries. When a sales job is not highly programmed, retailers are likely to use commissions. Span of control (Hypothesis 2) and outcome uncertainty (Hypothesis 3) also predict the choice of salary or commission, with low span of control and high outcome uncertainty related to the use of

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[2] Although it is possible to treat compensation as a continuous variable, measuring the percent of total compensation that is commission, it is preferable to use these dichotomous categories. One reason is that retailers think about compensation in dichotomous terms (Redinbaugh, 1976). The second reason is that retailers in this study simply did not use small commissions, either not using commissions at all or using substantial ones constituting at least 30 percent of total pay. The result is a bimodal distribution, best captured as a dichotomy.

[3] In contrast, logistic regression, an alternative to discriminant analysis, has asymptotic statistical properties and a probabilistic logic and produces coefficients and R-square values that, because they are elastic over the range of the criterion variable, are difficult to compare with one another and to interpret.

TABLE 2
Means, Standard Deviations, and Intercorrelations for All Variables[a]

Variables	Means	Standard Deviations	1	2	3	4	5	6
1. Job programmability	0.0	0.9						
2. Span of control	0.0	1.4	.23					
3. Outcome uncertainty	0.0	1.2	.18	.15				
4. Age of chain	24.6	23.0	−.34	.19	−.09			
5. Shoe store[b]	0.1	0.3	.14	.11	.17	−.25		
6. Average purchase size[c]	100.1	42.4	−.21	−.08	.07	−.12	−.05	
7. Compensation[d]	0.6	0.5	.55	−.18	.23	−.55	−.37	−.20

[a] $N = 54$; 21 stores used commissions and 33 stores used salaries.

[b] Dummy variable with 0 = not a shoe store, 1 = shoe store.

[c] In dollars.

[d] Dummy variable with 0 = commission, 1 = salary.

salaries. Table 4 indicates the classification table results of the discriminant analysis.

The level of job programmability was also hypothesized to moderate the relationship of span of control and outcome uncertainty to type of compensation (Hypothesis 4). To test this hypothesis, I split the group of stores into halves, one for high and one for low programmability. The results, shown in the last two columns of Table 3, confirm the hypothesized relation: at high levels of programmability, span of control, outcome uncertainty, and the results of the overall discriminant analysis are not significant. The sales jobs in these stores consist almost exclusively of cashiering, and the compensation in 23 of the 27 stores is salary. Thus, at high levels of programmability, stores use salaries almost exclusively, regardless of outcome uncertainty or span of control. In contrast, at low values of programmability, there are substantial numbers of stores using salaries and stores using commissions. Outcome uncertainty and span of control are significant predictors of compensation, and the results of the overall discriminant analysis are significant.

Institutional Theory

The institutional explanation relies on very different variables from those of agency theory. The hypotheses link newness, small average purchase size, and not being a shoe store to the use of salaries. Table 3 shows the results for the institutional model, which are statistically significant overall. The *R*-square of this model is only slightly less than that of the agency model. Newer stores and stores that are not shoe stores are likely to use salaries, thus supporting Hypotheses 5 and 6, respectively. The results for average purchase size (Hypothesis 7) are in the predicted direction but are not significant. Like the model based on agency theory, the overall model predicts the compensation plans of 80 percent of the stores correctly (Table 4).

TABLE 3
Results of Discriminant Analysis[a,b]

				Split-Half Data	
Independent Variables	Agency Model	Institutional Model	Combined Model	High Job Programmability	Low Job Programmability
Job programmability	.60***		.46***		
Span of control	−.35**		−.23*	−.30	−.44**
Outcome uncertainty	.17†		.12	−.11	.57***
Age of chain		−.47***	−.30**		
Shoe store[c]		−.26*	−.18†		
Average purchase size		−.16	.00		
Number of commission stores	21	21	21	4	17
R^2	.44	.39	.56	.11	.44
F^d	12.92***	10.63***	9.79***	1.46	10.00***
F^e of incremental R^2	6.05**	4.27**			
Canonical correlation	.66	.62	.74	.37	.67
Wilks's lambda	.56***	.61***	.44***	.89	.55***
Percent correctly classified	80	80	87	62	74
Classification accuracy, z^f	29.87***	29.87***	37.40***	−9.96	11.20***

[a] $N = 54$ for entire sample, 27 for split halves.

[b] In the two-group case, there is one discriminant function, and standardized regression coefficients, which are reported here, are proportional to discriminant function loadings (Green, 1978).

[c] Dummy variable with 0 = not a shoe store, 1 = shoe store.

[d] F is inversely proportional to Wilks's lamba for two-group discriminant analysis (Green, 1978: 294).

[e] See Green (1978: 75) for formula.

[f] Classification accuracy was computed using a z-statistic (Kosnik, 1987: 177).

† $p < .10$
* $p < .05$
** $p < .01$
*** $p < .001$

TABLE 4
Discriminant Analysis Classification Tables[a]

Actual Group	Predicted Group: Commission	Predicted Group: Salary	Totals	Percent Correctly Classified
1. Agency model				
Commission	18	3	21	80
Salary	8	25	33	
2. Institutional model				
Commission	14	7	21	80
Salary	4	29	33	
3. Combined model				
Commission	18	3	21	87
Salary	4	29	33	
4. Split halves[b]—High job programmability				
Commission	3	1	4	62
Salary	9	14	23	
5. Split halves[b]—Low job programmability				
Commission	14	3	17	74
Salary	4	6	10	

[a] N = 54.
[b] N = 27.

Combined Models

Table 3 also shows the agency and institutional models within the same discriminant analysis, and Table 4 reports their classification table results. The additional variance explained by both the agency and institutional models is significant (Table 3). The most important predictors are programmability and age of a store chain. Also significant are span of control and being a shoe store. Outcome uncertainty is in the predicted direction but is not significant. In summary, both agency-theory and institutional-theory variables contribute significantly to the explanation of compensation policy, which suggests that both perspectives are needed to understand compensation.

DISCUSSION

Three major points emerge. One is that agency theory provides a good description of compensation policies in the setting studied. The statistical significance of the model is strong, as are the operational significance of the R-square and the classification results. The qualitative data amplify these quantitative results. They indicated that, even in stores side-by-side with one another, different ideas about managing exist, and those differences are related to different patterns among the agency-theory variables and compensation.[4]

In stores with very programmed sales jobs and salary compensation, the qualitative data suggest a corresponding attitude toward managing. Managers view the sales job as a "revolving door" that offers salespeople short-term, extra money and gives retailers interchangeable bodies to fill a slot. Almost anyone can learn the jobs in a short time. As one manager said, "We offer just a job—just a way for people to earn some extra money. It's not a career."

In other stores, the sales job is regarded as essential and as requiring sophistication in product knowledge, customer taste, and consumer psychology. As the quantitative results indicate, stores with sales jobs with low programmability and salary compensation usually have a high level of supervision of the sales staff. The qualitative data suggest that the corresponding attitude towards managing is one of coaching. Managers espouse the importance of training a competent and loyal sales staff and claim to spend a good deal of their own time helping salespeople. Managers of these stores regard commissions as unfair and degrading.

In stores with jobs with low programmability and commissions, a third set of views prevails. The commissioned salespeople view themselves as professionals and commissions as an appropriate sharing of profits because professional salespeople make the store successful. Their managers emphasize the importance of extrinsic reward and competition in motivating people. They also argue that commissions are an effective way to select the best salespeople. As one manager said, "Only the good ones can make it here."

The second major point is that the institutional model also provides a good description of compensation practices in this setting. Again, the statistical and operational significances of the R-square and classification results are good. The age of the store chain gives a particularly strong result. What may be happening is that a store or store chain is initially structured with a compensation type that reflects the institutional environment at the time of founding. The compensation scheme then becomes legitimated over time within a store, and its continued use is rarely examined.

The qualitative data from store managers amplify the institutional explanation. Most store managers supported the compensation policy used in their store, regardless of compensation type, perhaps because they wished to portray their stores favorably. However, a more accurate explanation appeared to me to be that compensation policy is so institutionalized that the possibility of change is never considered. For example, only one manager could remember a switch between commissions and salaries. His store was in financial difficulty and management switched to commissions to stimulate sales.

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[4] I first observed these patterns in the anecdotal data and open-ended questionnaire responses on the pros and cons of salaries and commissions. I then interviewed a store manager representing each pattern to confirm the patterns and learn about the management philosophy of each. I also used the split-half quantitative analysis (Tables 3 & 4) to verify the patterns. The first pattern is evident in the almost exclusive use of salaries in high-programmability jobs (23 of 27 stores). The second and third patterns are evident in the significant ($p < .01$) relationship between span of control and compensation in the low-programmability jobs.

The third point is speculative. If both agency and institutional views explain compensation, what is happening? Clearly, they are complementary, and both institutional- and agency-theory variables affect choice of compensation policy. However, the equifinality of efficiency theories may also play a role. On the one hand, efficiency theories reveal that some ways of structuring are inefficient. For example, retailers generally did not combine highly programmed jobs and commissions, commissions and lots of supervision, and other elements that are inappropriate together according to agency hypotheses. On the other hand, efficiency theories generally do not yield a best way to organize, but rather, several best ways (Miles & Snow, 1978). In systems terms, there is equifinality, and several patterns of structures and processes are equally viable. For example, as described in the beginning of this section, retailers seem to use one of three patterns—highly programmed jobs and salaries, less programmed jobs and low span of control with salaries, and less programmed jobs and high span of control with commissions—all of which are theoretically efficient.

Past researchers (Child, 1972; Miles & Snow, 1978) have resorted to the concept of strategic choice to resolve the equifinality inherent in many efficiency approaches. The current research instead suggests an institutional explanation. Retail firms adopt a compensation policy that *fits* the levels of programmability and span of control. The choice among several efficient patterns of fit depends on institutional factors like current managerial practice, on outcome uncertainty characteristics in the business, and perhaps on strategic choice. Over time, a chosen pattern becomes further institutionalized within a firm. Thus, the resulting relationship between programmability, span of control, and compensation is both efficient and institutionalized. Future research could explore the validity of this idea.[5]

THEORETICAL ISSUES AND OPPORTUNITIES

Several opportunities for future research in agency theory emerge. One possibility would be to examine the efficiency implications of agency theory. For example, are stores with compensation plans that are consistent with predictions based on agency theory more efficient? Despite important measurement problems (Cameron & Whetten, 1981), such efficiency implications are a critical next step in the empirical development of agency theory.

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[5] Although a test of the equifinality idea is beyond the scope of this paper, the data are consistent with the interpretation, which first emerged from the qualitative data. I noted that the pattern of commissions, low programmability, and high span of control tends to appear in old firms, whereas the other two patterns appear in new firms. I verified this overall pattern using the correlation matrix (Table 2). Age is correlated in the suggested direction with the pattern variables, compensation, programmability, and span of control. Finally, I qualitatively observed that certain types of merchandise (e.g., shoes, cosmetics, jewelry) were always sold in the same way, which also suggests institutional patterning.

Another research opportunity is examination of causal direction. Agency theory, like other efficiency theories, is an equilibrium theory, and yet causal inferences are frequently made. In future research, it would be useful to examine the causal patterns among the agency variables. For example, do managers make compensation choices first and then decisions about programmability and span of control, or vice versa?

Several issues in institutional research emerge as well. For example, a difficult aspect of operationally defining institutional-theory variables is that the resulting hypotheses are so closely tied to given empirical settings. As DiMaggio and Powell noted, the institutional field "cannot be defined a priori, but must be defined on the basis of empirical investigation" (1983: 148). Thus, institutional thinking makes very powerful general observations about the importance of traditions, but institutional hypotheses are necessarily context-specific. Longitudinal research somewhat avoids this issue (Tolbert & Zucker, 1983). However, current institutionalized practices can only be defined in terms of empirical settings.

Another theoretical issue is how to accommodate conflict among institutionalized practices. Will a new shoe store adopt commissions because that is what shoe stores do, or will it use salaries because that is what new stores do? Several of the classification failures in this study resulted from such conflicts. More research is needed to understand how businesses actually resolve conflicting institutional rules.

CONTRIBUTIONS AND CONCLUSIONS

This study did not consider all the factors that might explain compensation choice, but it did make several contributions. Those include taking a more conceptual and thus more generalizable approach than has been used previously to explain compensation. The implication is that a theoretical view of compensation across many settings is possible. The contribution of agency theory to this research is a more balanced view of performance-contingent pay. As Pearce and colleagues (1985) noted, much of the compensation literature proceeds from an advocacy of performance-contingent pay. However, the agency results suggest that firms prefer pay based on behaviors and use pay based on outcomes only when behaviors are difficult to measure. That observation suggests a shift from the frequent research question of why so few firms use performance-contingent pay (Ungson & Steers, 1984) to the question of when such pay is appropriate.

The institutional-theory contribution is the recognition that founding conditions and simple industry traditions play an important role in determining compensation policies. Clearly, both agency and institutional variables should be an important part of future research on compensation. Finally, the contributions of the study to organizational theory are the recognition that efficiency and institutional perspectives can be complementary and that multiple perspectives can enhance our understanding of phenomena.

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APPENDIX

Construct Procedures

The first step was to assess unidimensionality of the multiple measures of constructs measuring job programmability, outcome uncertainty, and span of control. I assessed unidimensionality for each set of measures using a common-factors model with oblique rotation. Such a factor analysis assumes measurement error and nonorthogonal constructs, both of which are appropriate assumptions in field settings (Bagozzi, 1980). Unidimensionality was considered present when only one significant factor emerged using an eigenvalue of more than 1.0 as the cutoff (Bagozzi, 1980). This is a conservative test because it retains any linear combination that explains more variation than a single measure (Green, 1978).

The second step was to assess internal reliability. Internal reliability was measured by using a Cronbach alpha statistic with a 0.6 cutoff (Nunnally, 1967).

The third step was to create single construct measures. A single measure for each construct was constructed from multiple measures for that construct by using the factor-loading scores of the first factor. These loadings are the linear combination that accounts for the most variance in the set of measures as a whole (Green, 1978) and thus are a good measure of the underlying phenomena. In all cases, the first factor was the only significant one with an eigenvalue > 1.0 as the criterion (Green, 1978).

In the case of the programmability construct, it was necessary to adjust first for different numbers of informants per store. In order to do that, I first checked the unidimensionality and internal reliability of informants' responses for each item. I then averaged answers to the same question of informants in each store and proceeded as in the third step described above.

Construct Measures

Programmability. Four items measured programmability. The first was "How would you describe the service which you offer to customers? Check one," with 1 = customer fills out warehouse requisition, check out only, to 5 = customer is assisted continuously; response choices were a set of commonly used categories of service offered to customers (Redinbaugh, 1976).

The second item was "Approximately how much time is spent with the average customer who makes a purchase (minutes)?"

The third item was "How long would it take an average full-time salesperson to learn the basic duties of the sales job in your store? Circle one," with 1 = <3 days to 5 = >6 months.

The fourth item was "How would you describe your merchandise? Check one," with 1 = customer expends minimal effort to 3 = customer expends much effort to understand the features of the product and brand differences (Redinbaugh, 1976).

Span of control. Three items: "What is the size of this store (square footage)?", "How many salespeople work at this store?", and "How many managers and assistant managers work at this store?" Store size, number of salespeople, and number of salespeople per manager were the three measures of span of control.

Outcome uncertainty. The measure was based on failure rates reported in Dun and Bradstreet's *Survey of Retail Store Failures for 1975 and 1979* and on U.S. Bureau of the Census figures for the number of competitors in the San Francisco Standard Metropolitan Statistical Area during the period of data collection for each line of merchandise. Stores were typed by line of merchandise according to their designation in the shopping center's directory.

Age. One item: "When was this chain founded?" Age was then computed by subtracting the year given from 1981, the last year the data were collected.

Shoe store. Whether a store was a shoe store was determined by its designation in the shopping center directory.

Average purchase size. One item: "What is the average purchase size ($'s) in this store?"

Compensation. One item: "Which pay plan best describes the compensation of your sales staff? Check one." Responses were salary/hourly wage, commission only, base + commission, other—please explain. There were no "other" responses and only one "commission only" response; "base + commission" was considered a commission.

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ORGANIZATIONAL AND TECHNOLOGICAL PREDICTORS OF CHANGE IN AUTOMATICITY

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Programmable automation lies at the heart of competitive manufacturing, yet many firms have been slow to adopt new production technologies. This study attempted to develop a theory of change in automaticity integrating both organizational and technoeconomic approaches to process innovation. The data, based on a longitudinal study of 54 manufacturing establishments, were gathered in 1973 and 1981. During the intervening period, foreign firms made considerable inroads into American markets and thus provided incentives to innovate. Our analysis suggested that the magnitude of change in automaticity is partly a function of how well various dimensions of organizational structure enable an organization to respond to incentives, given the constraints of its extant production system.

Process innovation has become of special interest to researchers and practitioners because of the problem of American competitiveness internationally.[1] Isolated from international competition until the early 1970s, American industry has since felt widespread competition not only from Japanese automobiles, but from Brazilian shoes, German and Japanese machine tools, and Japanese electronics. The imbalance of trade that is partly a consequence of this international competition has helped make the United States the largest debtor nation and has led to a surge of interest in competitive manufacturing (Cohen & Zysman, 1987; Hayes & Abernathy, 1980; Hayes & Wheelwright, 1984; Lawrence & Dyer, 1983; Wheelwright, 1987).

The adoption of programmable automation[2] technologies is often heralded as a solution to the problem of competitive manufacturing. Yet few

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[1] We define process innovation as any operations technology that is new to the adopting organization. Product innovation refers those things that are made for consumption by customers and that are new to the adopting organization (Tornatsky et al., 1983: 1–2).

[2] Programmable automation, unlike conventional, or hard automation, uses computers to control machines. Conventional automation relies on mechanical or electromechanical devices to control machines. According to the Office of Technology Assessment, "the use of computers

studies of innovation in organizations have focused on major changes in production technologies associated with the development of new industries or the revitalization of existing ones (Hage, 1980; Zaltman, Duncan, & Holbek, 1973). Studies of process innovation in specific industries, such as suppliers to the food processing sector (Ettlie, 1983; Ettlie, Bridges, & O'Keefe, 1984), shoe manufacturers (Duchesneau, Cohn, & Dutton, 1979), and automobile manufacturers (Abernathy & Wayne, 1974; Utterback, 1979), have begun to identify how characteristics of organizations affect the adoption of new process technologies. Our objective was to develop a theory of change in automaticity of production technologies that would integrate both organizational and technological determinants of process innovation and to test that theory by comparing manufacturing establishments in a diverse sample of American industries during the period 1973–81. During those eight years, foreign firms achieved rapid and widespread penetration in the manufacturing sector and thus gave U.S. firms an incentive to adopt programmable automation technologies. We attempted to show the extent to which firms responded to those incentives by implementing programmable automation technologies and why the innovativeness of firms varied during the period studied.

There are two dominant perspectives on how characteristics of organizations affect innovation: the structural and the technoeconomic. Researchers who take the structural perspective have focused on how patterns of social relations affect the amount, rate, and permanence of technological innovations (Baldridge & Burnham, 1975; Beyer & Trice, 1978; Burns & Stalker, 1961: Ettlie, 1986; Hage, 1980, 1986; Hull & Hage, 1982; Kimberly & Evanisko, 1981; Landau, 1982; Ogburn, 1950; Solberg, Anderson, Barash, & Paul, 1985). A recent review of the literature on innovation conducted by the National Science Foundation (Tornatsky et al., 1983) concluded that much of the innovative malaise in manufacturing organizations is due to managerial and organizational characteristics. Researchers taking the technoeconomic perspective, on the other hand, have primarily been concerned with how the juncture of internal manufacturing processes and external market factors affect the type (e.g., product vs. process) and rate of innovations within firms (Abernathy & Townsend, 1974; Abernathy & Wayne, 1974; Pavitt & Rothwell, 1976; Utterback, 1971; Utterback & Abernathy, 1975). For example, Abernathy and Wayne's (1974) study on limits to the learning curve focused on how highly specialized manufacturing facilities constrain future technological choices. Although there has been a technology school in organizational sociology (Perrow, 1967; Woodward, 1965), there has been little research in organizational studies on how technology affects rates of either product or process innovation.

Footnote 2—continued
and communications systems allows these machines to perform a greater variety of tasks than fixed automation can perform, and to automate some tasks which previously necessitated direct human control" (1984: 33). Programmable automation includes such technologies as computer-aided design, robotics, numerically controlled machine tools, flexible manufacturing systems, automated materials handling, management information systems, computer-aided planning, and, when all the preceding are brought together, computer-integrated manufacturing.

Perhaps owing to disciplinary boundaries, contributors to the innovation literature have inadvertently treated social and technical determinants of innovation separately. Since technology and organizational structure are to some extent interdependent, in effect if not by design (Scott, 1987), it is imperative that researchers understand how the two factors affect an organization's propensity for change in automaticity.[3] Building on both the structural and the technoeconomic perspectives, this study broadened its scope to examine conflicting as well as complementary influences of the structural and technological factors. For example, is the low rate of innovation in highly developed production systems due to the technology employed (Utterback & Abernathy, 1975) or to the accompanying organization design (Burns & Stalker, 1961)? Why are mechanistic organizations slow to adopt programmable automation technologies even though there are numerous competitive advantages to automating, such as improved quality and lowered cost? Answers to those questions are at the heart of the problem of competitive manufacturing (Tornatsky et al., 1983), and they will extend scholarly understanding of how the characteristics of organizations affect changes in manufacturing technologies.

REVIEW OF THE LITERATURE

According to both the structural and the technoeconomic perspectives on innovation, differences in the extent of firms' innovativeness are partly a function of (1) external incentives for change, such as changes in product demand; (2) internal mechanisms like technical experts who help firms identify solutions to problems; and (3) internal mechanisms that enable change when change is necessary, such as low formalization or flexible manufacturing technologies (Daft & Becker, 1978; Utterback & Abernathy, 1975). The two perspectives vary in terms of the specific causes of differences in innovativeness and the importance attributed to those causes.

The Structural Perspective

The structural perspective suggests that different organizational structures vary in their capacity for change because of the patterns of social action that those structures encourage. The major causal mechanisms that have been proposed are the impact of structure on the amount and quality of information in an organization, the variety of perspectives involved in decision making, and the extent to which members of an organization monitor the external environment. One of the first and most influential studies adopting this perspective was Burns and Stalker's (1961) study of innovation and change in the Scottish electronics industry. Burns and Stalker found that mechanistic organizations—those characterized by hierarchical authority, control, communication, and so forth—had lower rates of innovation than their organically structured counterparts, which were characterized by networks of authority, control, and communication. This seminal finding has received widespread confirmation (Aiken & Hage, 1971; Baldridge & Burnham, 1975; Beyer & Trice, 1978; Blau & McKinley, 1979; Daft, 1982; Daft & Becker, 1978; Hage, 1980; Hage & Aiken, 1967, 1970; Hull & Hage, 1982; Kimberly & Evanisko, 1981; Lawrence & Lorsch, 1967; Robertson & Wind, 1983; Rothman, 1974; Zaltman et al., 1973).

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[3] Most comparative organizational studies of structure and technology have found that structure is most strongly associated with technology in sectors that are close to the work-flow (Fry, 1982; Gerwin, 1981; Mintzberg, 1979). The current prevailing view is that Woodward's (1965) sweeping "technological imperative" has been refuted. However, some researchers (Aldrich, 1972; Fry, 1982; Gerwin, 1981; Hage & Dewar, 1978) have criticized much of the empirical work for its underdeveloped theoretical approach to the topic.

Organically designed organizations promote innovation because of their high complexity, decentralization, and low formalization (Hage, 1980: 161–206). Complexity increases an organization's awareness of a need for change, improves the flow of diverse ideas, encourages debate over the merits of new technologies, and provides a high degree of cognitive breadth of decision-making processes. Decentralization of authority in organic organizations increases the total pool of available ideas, keeps decisions close to the source of variation or need, improves the chance that compatible technologies will be proposed and adopted, limits the number of filtering devices and thereby limits the inevitable loss of information as decisions are passed up the organizational hierarchy, and increases the acceptance of and commitment to change. Organizations with low behavioral formalization maintain flexible organizational roles and work units, have fewer and less rigid communication barriers than other organizations, and do not reward behavior on the basis of historical precedents as contained in written rules, regulations, and policies. Together, those characteristics help prevent the emergence of "groupthink" (Janis, 1972) and promote long-term strategic planning.

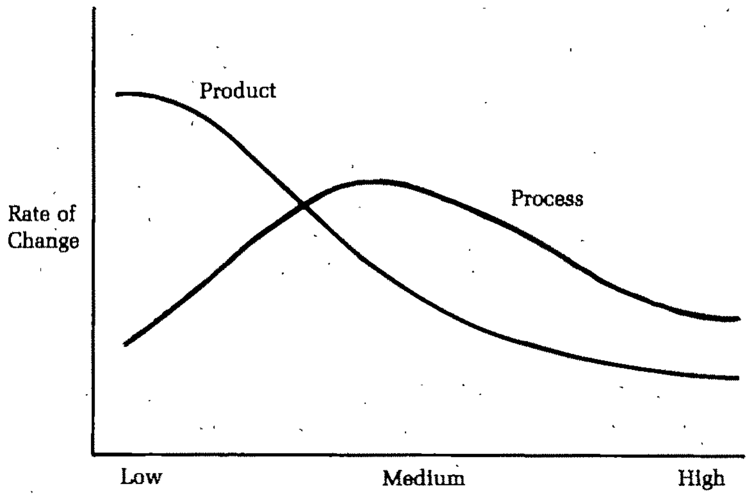
The Technoeconomic Perspective

The structural perspective has concentrated on the role of organizational design in the innovation process, but the technoeconomic perspective has examined how characteristics of production technologies themselves—that is, the physical processes, methods, techniques, tools, and equipment of production (Skinner, 1978: 464)—affect organizational capacity for subsequent technological change. Most investigators adopting this perspective have assumed that changes in an organization's dominant markets, such as changes in a product's life cycle or in number of competitors, externally determine the desire to adopt process innovations. However, extant technological attributes affect the manner and degree to which managers can respond to market pulls and technological push because of such factors as fixed costs and technical feasibility.

The most widely cited explanation of how production technology affects rates of innovation is Utterback and Abernathy's (1975) dynamic model of product and process change in strategic business units. The three key factors explaining this dynamic model of innovation are market demand, production technology characteristics, and a firm's strategy for competition and growth. In this model, the rates of process and product innovation follow distinct curvilinear patterns, as shown in the top part of Figure 1. Specifically, product innovation is high in early stages of a firm's life but begins to decline at an accelerating rate over its life course. Process innovations are initially low but increase dramatically once product markets begin to mature and technologies become better understood. Over time, however, both process and product innovation begin to taper off sharply owing to stable or declining market demand, diseconomies of scale, and inflexible production technology. Thus, at the highest stage of development, little innovation occurs.

Sahal (1981) developed a similar theory of process innovation but focused more on the role of extant production operations in the innovation

FIGURE 1
Rates of Process and Product Change in Manufacturing Organizations[a]



Production System Development

1. Woodward type	Small batch	Large batch and mass	Continuous process
2. Machinery	General purpose; nonautomated or single cycle	Specialized, but retoolable; repeat cycle	Highly specialized; automated
3. Material transfer devices	Dollies, powered truck	Conveyors, pullies	Pipes, conveyors
4. Work-flow	Flexible	Fairly rigid; segmented	Rigid; systematic
5. Task variability	High	Medium-low	Low

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[a] Adapted from Utterback and Abernathy (1975). The five categories below the chart illustrate our operational definition of production system development. Also see the Appendix.

process than on market characteristics. Sahal argued that technological advance depends on a minimal level of certainty in the production process. Production certainty is accomplished as products mature and become familiar to most users. As an organization gains experience with a given technology, it realizes how to further improve it, a process that is the essence of the "progress principle" (Dutton & Thomas, 1984: 235). Over time, the scale of the firm's production system increases, which in turn increases its operational complexity. To cope with the problems of complexity, the organization adopts more and newer technologies. Once the production system becomes excessively large in scale and operationally complex, however, further technological change is essentially thwarted. Thus, the rate of technological change at first increases in response to increases in operational scale and complexity but then decreases when scale and complexity become great.

Studies by Bright (1958), Abernathy and Wayne (1974), Abernathy and Townsend (1974), Kelly and Kranzberg (1978), and Dutton and Thomas (1984) have confirmed the basic thesis of the technoeconomic perspective when applied to the strategic-business-unit level of analysis. However, its applicability is limited at the industry level (Pavitt & Rothwell, 1976; Porter, 1988). Utterback and Abernathy's (1975) model originally focused on strategic business units, and this was our aim as well.

TOWARD AN INTEGRATIVE THEORY OF CHANGE IN AUTOMATICITY

Both the structural and technoeconomic perspectives seek to explain changes in production technologies, and both perspectives have marshaled considerable support for their models. But are these explanations complementary or contradictory? According to the technoeconomic perspective, innovation peaks in mass production systems (Utterback & Abernathy, 1975). But according to research by Woodward (1965) and others (Blauner, 1964; Mintzberg, 1979), mass production systems are likely to be bureaucratic. To the extent this is so, then it would seem that the two perspectives yield contradictory predictions. The condition that, according to the technoeconomic perspective, is optimal for a high degree of process innovation—the existence of a moderately large, routinized production system (Figure 1)—is positively associated with a mechanistic-bureaucratic organizational structure. Yet bureaucratic structure lowers the probability that an organization will be innovative (Hage, 1980). If we hypothesize that structure and technology are equal partners in the innovation process, the effects of technology and structure on innovation would effectively cancel each other out.

Sociotechnical systems theory provides an alternative explanation of how technology and structure affect innovation: structure and technology multiplicatively codetermine organizational outcomes (Emery & Trist, 1960; Herbst, 1974; Trist, 1981). According to that theory, organizational structure and technology are somewhat loosely coupled, yet performance is a function of how well the two subsystems are jointly optimized. Concurring with this perspective, we postulated that the joint effects of structure and technology on process innovation were multiplicative rather than additive or matching

(Joyce, Slocum, & Von Glinow, 1982; Schoonhoven, 1981). A multiplicative relationship means that "the effect of one variable, X_1, is increased by higher values of the other, X_2, . . . and produces the most pronounced impact on the dependent variable when both exhibit high values" (Schoonhoven, 1981: 355). The reasons we predict a multiplicative effect are complex and provided below. Essentially, the theme is that the way in which production systems are organized has implications for the effects of complexity, centralization, and formalization on innovation, and vice versa.

Production systems set broad limits on the extent or rate of technological change. We base this assertion on the fact that new technologies are dimensionally similar to extant production technologies. Consequently, technological change in ongoing manufacturing establishments is more or less constrained by the extant characteristics of a production system. For example, batch production systems have historically been characterized by unsophisticated machinery, wide scope, high variability, low integration, and low regulation (Collins, Hage, & Hull, 1988; Lengnick-Hall & King, 1986; Reeves & Turner, 1972; Woodward, 1965). Those technological characteristics are fairly easy to change. Conversely, it is much more difficult to change highly sophisticated, specialized, and integrated production systems. Thus, as a technical system evolves, an organization confronts different constraints and opportunities that are due in part to the characteristics of the production system itself.

To understand how technology moderates the relationship between structure and innovation, we examined three widely accepted dimensions of organizational structure: complexity, the formalization of rules and procedures, and the decentralization of authority (Hage, 1980; Hall, 1982; Hickson, 1966; Scott, 1987). Studies of organizational innovation have indicated that not all aspects of structure are equally powerful in explaining innovation (Hage, 1980; Hage & Dewar, 1973). Complexity is usually the most important, decentralization the second most important, and formalization the least important structural variable associated with innovation. The systemic nature of structure also means that these variables are often intercorrelated, so that the impact of any single variable is reduced in a multiple regression equation.

Complexity. The effect of complexity on change in automaticity can be understood in terms of how technology affects the level of knowledge and type of specialisms of members and the locus of that knowledge in an organization. In production systems that are not highly developed, there are proportionately fewer production process specialists than in more advanced production systems. Lack of repetition in production, a heavy emphasis on product performance as opposed to process performance, and a dynamic market place that causes continual change in products account for the varying numbers of production specialists. In less developed production systems, craftsmen who are highly skilled in customizing products to adapt to market change but not very good at rationalizing the production process typically hold production knowledge. Consequently, when an incentive for radical change in batch production technologies is recognized, the identification of new and pertinent production processes often depends heavily on external vendors (Utterback, 1979). Moreover, externally purchased machines can be used with relatively little modification. In contrast, advanced production systems require extensive modification of new technologies to integrate them with extant highly specialized and sophisticated machines and processes. Thus, the direct positive effect of complexity on change in automaticity is less salient in batch operations than it is in more developed production systems.

The scale and complexity of highly developed production systems also produce a shift in the locus of knowledge away from product generalists to process specialists, since the operational goal in advanced production systems is to rationalize production processes so that they can cope with the strains accompanying scale (Hull & Collins, 1987; Mintzberg, 1979; Sahal, 1981). Whereas specialists in less technically developed systems are likely to be concerned with product-oriented research and development, specialists in more developed technical systems are likely to be mechanical engineers, methods specialists, and systems analysts. The latter are devoted to addressing process problems, since advances in productivity are much more likely to come as a result of process innovation than of product innovation (Landau, 1982). The composition and focus of specialists and the dedicated nature of the production technology mean that high concentrations of specialists are going to have a stronger positive effect on change in automaticity in advanced systems than in less developed systems. In the latter, the effects of specialists are indirect, mediated by processes of product change. Therefore, although high concentrations of specialists will have a positive effect on technological change in all technical systems, we hypothesized that:

> *Hypothesis 1: The greater the complexity, the greater the change in automaticity, especially when production system development is high.*

Decentralization. The effect of decentralization of decision making on change in automaticity would also vary according to the level of production system development. Such variation will occur because of the marginal utility of decentralizing decisions in different production systems, the presence or absence of skilled or unskilled employees, and the likelihood that a crisis will occur in a particular production system.

One way production system development affects innovation is through its propensity for pushing the locus of knowledge away from craftsmen to production-control specialists, as in Mintzberg's (1979) technostructure, and away from human skills to machines and symbolic processes like computer programs (Shaiken, 1986). The shift in the locus of relevant production knowledge reduces the positive benefit of decentralizing decisions to line operations because the utility of decentralizing decisions depends on the amount of knowledge a decision maker has of a total production process (Gross, Giacquinta, & Berstein, 1973). Therefore, when a production system is integrated, rigid, and specialized, absolute decentralization to the lowest ranking worker is not likely to have as strong a positive effect on radical change as it would in a less integrated, less rigid, and less specialized production system.

Moderately advanced production systems also have proportionately fewer skilled employees (Blau et al., 1976; Office of Technology Assessment, 1984; Woodward, 1965). Hull and Collins (1987) found that mass production establishments have approximately one-third to two-thirds the amount of research and development employees and approximately two-thirds the degree of occupational specialization of technical batch operations. To the extent that the effectiveness of decentralizing decisions is enhanced where knowledge is concentrated, the proportionately lower average skill level in highly developed production systems reduces the incentive of the dominant coalition to decentralize to employees. In contrast, where there are high proportions of craftsmen and where those craftsmen are central to an overall production operation, there is an incentive to give them some authority because of their expertise (Hickson, Hinings, Lee, Schneck, & Pennings, 1971). Thus, the effects of decentralization on innovation are likely to vary by level of technological development in a production system.

Another reason the effects of decentralization on innovation depend on characteristics of production systems is that some production systems are more crisis-prone than others. The basic argument is that the greater rigidity and specialization of advanced production systems makes it difficult to change their characteristics if a technology becomes obsolete or if shifting market demand requires product changes. When changes of sufficient magnitude occur, the affected organization finds itself unable to quickly respond. That inability to respond creates crisis-like conditions in the organization. For example, one firm we studied had such a large-scale, highly developed production system that it took several years and tens of millions of dollars to change its technology, even though Japanese imports had been eroding plant sales and profits for several years before the plant upgraded the technology. Abernathy and Wayne (1974) found similar diseconomies of scale in the Ford Motor Company's attempt to change the Model T. Thus, under conditions of turbulence, highly developed production systems are more crisis-prone than less developed systems.

Technological change that is fueled by a crisis is not as likely to be associated with decentralization as technological change that is motivated by technological opportunity (Knight, 1967). Organizations typically respond to a crisis by centralizing decision making, particularly with regard to innovation (Cameron, Kim, & Whetten, 1987; Hage, 1980; Knight, 1967). Centralizing decisions in a period of rapid change can, of course, compound a problem (Benveniste, 1977; Cameron, Whetten, & Kim, 1987).

Organizations rarely unilaterally decentralize or centralize all decisions, and some types of decisions seem to be more related to technological change than others. Thus, we expected to find differences in the effects of decentralization according to the type of decision. Jennergren (1981) argued that operating decisions—those having to do with the functioning of a production system—are more likely to be decentralized than are strategic decisions, such as decisions pertaining to the basic goals, policies, and practices of an organization. But to what extent are such practices effective for innovation and change? If we accept the supposition that the effectiveness of decentralizing decisions depends on knowledge of problems and the ability to determine the best solution to a problem, it follows that some types of decisions will have a more positive effect on change in automaticity than other decisions. For example, a firm's production head is unlikely to have any real knowledge of markets or of the technical feasibility of product-related decisions, and thus simply decentralizing all decisions to that individual will not increase the rate of product development (Daft, 1978; Kimberly & Evanisko, 1981).

Operating decisions will have a greater effect on change in automaticity than will strategic decisions because, relatively speaking, line-operating decisions are dimensionally closer to technological change in production than are strategic decisions, and that closeness gives decision makers more knowledge of both problems and solutions. Conversely, strategic decisions are likely to have a stronger effect on product change, since major product change generally reflects new strategic aims. It is important to realize, however, that in some circumstances process innovations can have important strategic implications. On the basis of those arguments, we predicted that:

> *Hypothesis 2a: The greater the decentralization of strategic decisions, the greater the change in automaticity, especially when production system development is low.*
>
> *Hypothesis 2b: The greater the decentralization of line-operating decisions, the greater the change in automaticity, especially when production system development is low.*
>
> *Hypothesis 2c: The decentralization of line-operating decisions will have a stronger effect than the decentralization of strategic decisions on change in automaticity.*

Formalization. Formalization leads to both structural and communicative rigidities that thwart organizational attempts to change technologies once problems have been identified. For example, it is not uncommon for managers to face such highly specified work rules and procedures that their attempts to introduce new work methods or machinery in order to become more competitive are effectively neutralized by the existing policies. This idea is analogous to Kerr and Jermier's (1978) theory of substitutes and neutralizers of leadership. Thus, the effect of behavior formalization on change in automaticity is usually negative, although here too we expected the magnitude of the effect to depend on the level of production system development.

Behavior formalization is a primary control mechanism in production systems that are not highly advanced since the technology is nonspecialized and highly flexible. Thus, formalization is fundamentally singular in its effects on rigidity in work and communication. In advanced production systems, behavior formalization is less likely to inhibit innovation because the operations are more mechanically determined. The worker either becomes appendaged to assembly-line operations or freed from the machine interface as in continuous process plants (Blau & Schoenherr, 1971; Blau et al., 1976; Blauner, 1964; Woodward, 1965). Work rules and procedures are then but a small part of the highly impersonal control mechanisms embedded in the production process itself. Therefore, reducing the number of bureaucratic rules does little to alter the overriding degree of mechanized control in an advanced production system (Bright, 1958; Mintzberg, 1979; Woodward, 1965). Such differences in the mix and scope of control mechanisms in different production systems affect the contribution of behavior formalization to innovation. Therefore,

> *Hypothesis 3: The greater the formalization, the less the change in automaticity, especially when production system development is low.*

METHODS

Sample

The data analyzed in this study were collected from the same firms at two points in time. The first wave consisted of 110 randomly selected New Jersey manufacturing establishments. Data for the first wave of measurement were collected by Blau and his associates in 1972–73 and reported in 1976. The second wave consisted of 85 manufacturing establishments. The attrition of firms from the first wave to the second wave was caused primarily by organizational death. Data for the second wave were collected by the authors in 1980–81 as part of a restudy sponsored by the National Science Foundation. Of the firms in the second wave, 54 cases had usable information on the dependent variable, change in automaticity. As the data in Table 1 indicate, the characteristics of 54 organizations used in this study did not differ substantially from the full sample of the first wave of measurement in terms of type of production operations, industrial groups represented, and unionization.

The United States Bureau of the Census defines an operating manufacturing establishment as a business establishment at a distinct location that is engaged in "the mechanical or chemical transformation of inorganic or organic substances into new products" (United States Bureau of the Census, 1975: 1–8,1–9). In most cases, the manufacturing establishments studied here were subunits of an off-site parent company, thus typifying the dominant operational mode in American industry (United States Bureau of the Census, 1975). New Jersey was chosen as the location of the study because its "wide variety of manufacturing firms are representative of American industry as a whole" (Blau et al., 1976: 131).

The factories in the original sample were intended to be medium to large in size, with size measured in terms of number of employees. The actual

TABLE 1
Characteristics of the Sample

Characteristics	1973	1981
Number of cases	110	54
Size[a]	529	585
Production technology[b]		
Batch	51	44
Mass	38	44
Process	11	11
Major industrial groups[b]		
Chemical and allied products (SIC 28)	17	15
Fabricated metal products (SIC 34)	14	17
Machinery, except electrical (SIC 35)	7	11
Electrical equipment and supplies (SIC 36)	12	9
Unionized[b]	80	84

[a] Size was measured as mean number of employees.
[b] Values are percentages.

mean size was 529, with a range of 73 to 4,701. The factories studied in the second wave were somewhat larger on the average than those in the first wave, with a mean of 585 employees. Seventeen of the 20 major Standard Industrial Code industrial groupings were represented in the original sample, with the greatest concentration in "chemicals and allied products" (SIC code 28) and in "fabricated metal products" (SIC code 34). The firms measured for the second wave included representatives of virtually all the same industries. These statistics indicate that the sample was fairly representative of American industry as a whole.

Both waves of measurement relied on key informants in such different functional areas as strategic management, personnel, marketing, finance, R&D, and production to answer objective, or nonattitudinal, questions about organization-level structure, processes, and performance outcomes. The second-wave instrument included all the questions from the 1972–73 questionnaire plus a set of new variables that focused more broadly than the earlier instrument on technical-market factors, productivity, and innovation. In addition to structured interview schedules, the second study also employed archival data and observation-based field notes from plant tours and discussions with managers. Where possible, questionnaire responses were checked for reliability through official records and retrospective questioning. For example, sales information was gathered from both plant managers and sales managers and compared to official documents such as annual reports.

The data presented here provide an opportunity that is unique in comparative organization studies for estimating changes in automaticity over time, and they reflect the trend toward longitudinal field studies of organizations (Cameron et al., 1987; Dewar & Hage, 1978; Miller & Friesen, 1984; Van de Ven & Walker, 1984).[4] Our analysis used values for structure and technology from the 1973 data to predict the degree of change in automaticity in these organizations between the two measurement periods. The 1973–81 period corresponds precisely to the period in which American industry was first experiencing major competition from foreign firms.

Measures

Change in automaticity. The magnitude of change in automaticity was measured as the percentage of change from 1973 to 1981 in a plant's manufacturing-equipment automaticity scores. The mean percentage change in automaticity from 1973 to 1981 was 55.89 percent, with a standard deviation of 88.95 percent (Table 2).

Automaticity was measured by Amber and Amber's (1962) scale of automaticity (see the Appendix). This measure of technological change has several advantages over more conventional approaches to measuring process innovation that identify specific technologies and then indicate an organization's rate of adoption of those technologies. First, the measure used here identified manufacturing process innovations that have been implemented rather than simply adopted. Several authors (Eveland, 1979; Hage, 1980; Zaltman et al., 1973) have noted the importance of going beyond the adoption decision when studying innovation in organizational settings because organizations often fail to actually carry out innovations. Second, our measure allowed for comparison across discrete types of production systems that are not otherwise strictly comparable. For example, a small machine shop is less likely to use robotics than is a large-scale assembly operation. If we had simply counted numbers of robots we would have inadvertently given an advantage to organizations with large-volume operations, since that is where robots have been used most successfully. Focusing on the proportion of automated machinery allowed comparison of disparate technologies. Finally, our geometrically weighted automaticity measure captured the magnitude of the change by giving disproportionate weight to machines at the highest levels of the Amber and Amber (1962) scale of automaticity. Thus, large percentages of change in automaticity generally reflect the movement from mechanization to computerization—a quantum technological change, according to most experts (Groover, 1980; Schemmer, 1981; Shaiken, 1986; Skinner, 1978; Solberg et al., 1985). There was a high correlation (.84) between our measure of change in automaticity and the weighted percentage of computerized machinery (level 5 of the Amber and Amber scale).

Production system development. Our measure of production system development followed the logic of Woodward's (1965) original technical complexity scale, which has been widely used to measure the extent of production system development. It was more precise than the original Woodward

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[4] A survey of organizational-theory articles published in the *Academy of Management Journal*, *Administrative Science Quarterly*, the *American Journal of Sociology*, and the *American Sociological Review* from 1980 to 1987 found approximately 36 longitudinal studies. Most longitudinal studies used archival data rather than field data.

TABLE 2
Descriptive Statistics and Correlations

Variables	Means	s.d.	1	2	3	4	5	6	7	8	9
Process innovation											
1. Change in automaticity	55.89	88.95									
Technology											
2. Production system development	−0.07	2.51	−.40*								
Structure											
3. Complexity	8.86	7.72	.27*	−.27*							
4. Decentralization of strategic decisions	1.57	1.49	.18*	−.24*	.43*						
5. Decentralization of line-operating decisions	5.62	1.56	.26*	−.09	.07	.20*					
6. Formalization	4.74	2.03	.07	−.02	.15	.13	.40*				
Cross-product terms											
7. Complexity × production system development	−5.99	28.76	−.27*	.74*	−.45*	−.15	−.01	−.12			
8. Strategic decentralization × production system development	−3.36	14.87	−.34*	.62*	−.25*	−.16	.07	−.03	.70*		
9. Line-operating decentralization × production system development	−1.58	28.68	−.48*	.94*	−.25*	−.19*	−.08	.05	.76*	.67*	
10. Formalization × production system development	−0.19	13.34	−.38*	.86*	−.28*	−.21*	.01	.14	.73*	.61*	.91*

*$p < .05$

scale, however, in that it included several additional measures of technology. Our scale summed the standardized scores of five technology measures: Woodward's technical complexity scale; machine automaticity (1973); percentage of mechanical material-transfer devices; work-flow rigidity (Hickson, Pugh, & Pheysey, 1969); and percentage of sales of standardized products. All of the measures were based on 1973 data. Scores ranged from −4.4 (low production-system development) to 6.5, with a mean of −.07 and a standard deviation of 2.5 (Table 2). The Appendix contains further details.

Organizational structure. Four structural variables were included in the analysis: complexity, decentralization of strategic decisions, decentralization of line-operating decisions, and formalization. All of these measures were based on the 1973 data collected by Blau and his colleagues (1976).

Complexity referred to the degree to which labor was divided on the basis of specialized knowledge, as indicated by the percentage of professional and technical employees (Hage, 1980; Hall, 1982). As Hall noted, this concept is based on the assumption that "the more training (and education) people have, the more they are differentiated from other people who might have similar amounts of training but in different specialities" (1982: 79). In contrast, task and job specialization mean that people are doing highly specialized and differentiated tasks but the type and level of knowledge employed is relatively undifferentiated. Complexity in this sense is not just a number of jobs in an organization or boxes on an organization chart (Blau & Schoenherr, 1971); it is directly related to organizational awareness of performance problems and solutions to them. The factories had an average of 8.86 percent of employees in professional-technical occupations, with a range of 0 to 38.5 percent (Table 2). Five factories had 20 percent or more professional-technical workers. See the Appendix for further measurement details.

Decentralization referred to the locus of decision-making authority within a plant. Items measuring decentralization were divided into two classes of variables that captured fundamental differences in types of decisions (Jennergren, 1981): *strategic* and *line-operating*. Practically speaking, most strategic decisions are shared by the highest executive and the executive one level below the highest executive (mean = 1.57; Table 2). Operational decisions are typically made at the production-head level (mean = 5.62; Table 2). Not surprisingly, strategic decisions were considerably more centralized than line-operating decisions. The Appendix gives further details.

Formalization was defined as the extent to which activities were prescribed in an organization (Hall, 1982). Our measure, which is described in the Appendix, was developed by Blau and his colleagues (1976) and was based on the Aston studies' measurement of the concept (Hickson et al., 1969; Pugh, Hickson, Hinings, & Turner, 1968). Most plants were moderately formalized (mean = 4.74), and scores ranged from 0 to 9 (highly formalized) (Table 2).

Analytic Procedures

Moderated regression analysis was employed as our primary analytic technique since we postulated that technology moderates the strength of the effect of structure on change in automaticity (Arnold, 1982; Kerlinger & Pedhazer, 1973; Stone & Hollenbeck, 1984). Statistically significant results for the cross-product terms would support our theory that changes in production system development, the moderator variable, affect the magnitude of the relationship between the structure and change in automaticity. We employed a combined hierarchical and stepwise moderated regression procedure. First, we entered all main effects in stepwise fashion until all variables were in the equation. Second, the cross products were entered stepwise until all variables were in the equation. This approach reduces the problem of multicollinearity that occurs in conventional moderated regression analysis when the same variable is included in several cross-product terms (Fry & Slocum, 1984).[5]

To illustrate the interactions, we followed a technique suggested by Cohen and Cohen (1983: 320–325; cf. McKinley, 1987). This technique uses a complete regression equation to estimate the slope for variables X_1 and Y at representative low and high values of the moderator variable (one standard deviation above and below the mean), with the remaining variables treated as constants. Schoonhoven (1981) used a similar technique for graphing interactions based on partial derivatives.

RESULTS

Extent of Change in Automaticity

Automaticity increased from an average score of 265 to an average 360—a 56 percent change from 1973 to 1981. This amount of change is considerable in light of the facts that, in 1981, 84 percent of the factories were unionized and 69 percent of their principal products were described by marketing managers as "mature." As depicted in Figure 2, in 1973 single-cycle equipment at Amber and Amber's (1961) level 2 accounted for most production capacity. However, the percentage of machines in this category decreased during the next eight years. The greatest increase was at the highest two categories of the automaticity scale, levels 4 and 5. At level 5, equipment is fully computerized and automatic, and its use marks a discontinuous change from use of lower levels of equipment. The results corroborate those of other studies to some extent by suggesting that from 1973 to 1981, organizations moved away from conventional hard automation to programmable automation (Solberg et al., 1985). That finding is especially noteworthy since these data cover a period when the costs of programmable automation were high and their availability low by current standards.

Change in Automaticity by Level of Production System Development

As shown in Figure 3, the more advanced a production system in 1973, the less likely it was to further automate during the subsequent eight years.

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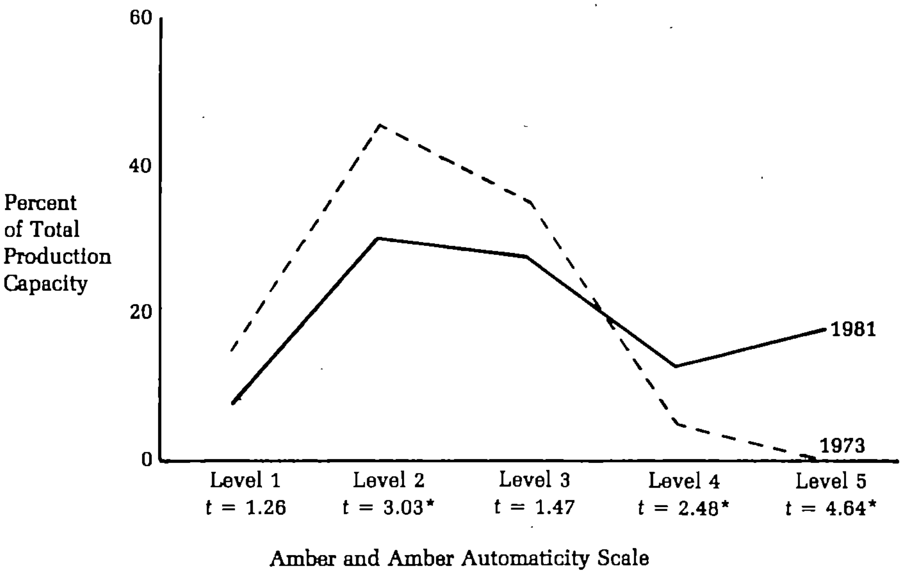
[5] All bivariate relationships were examined for serious violations of regression assumptions (nonnormal distributions). A test of multicollinearity suggested by Belsley, Kuh, and Welsch (1980) indicated that there were no serious collinearity problems with the data.

FIGURE 2
Estimated Percent of Production Capacity at Each Level of Automaticity,[a] 1973 and 1981



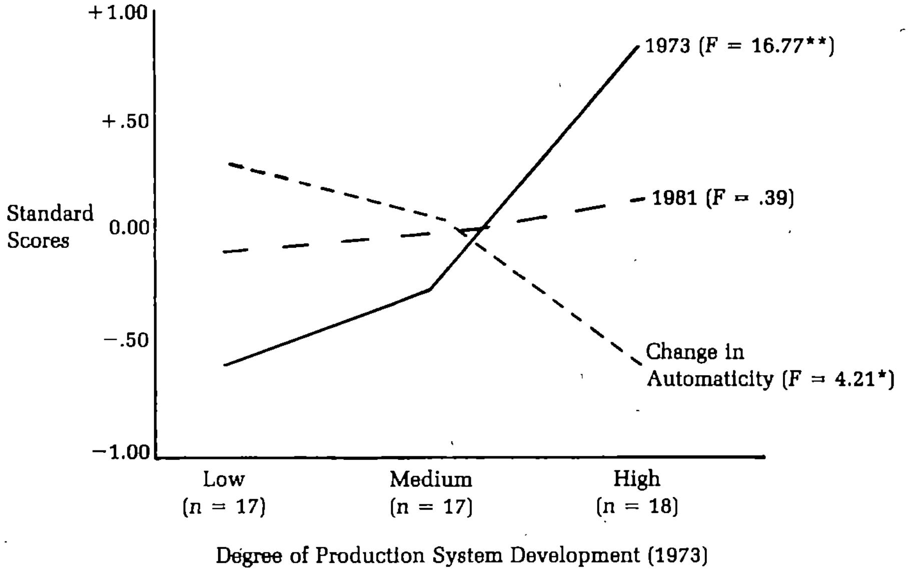
[a] Level 1, nonautomatic, powered; level 2, single-cycle machinery; level 3, repeat-cycle machinery; level 4, automatic feedback control; level 5, computer control; all values are weighted. Values for t compare means for 1973 and 1981 at each level of automaticity.

*$p < .05$

Firms with the lowest levels of production system development in 1973 had a 91 percent increase in automaticity—the highest percentage increase in the sample—followed by the moderate category, with a mean percentage increase in automaticity of 71 percent, and by the most developed category, with a mean percentage increase of 11 percent. Consequently, production systems with low and moderate development had almost equal levels of automaticity in 1981. This net change resulted in there being no significant differences in the level of automaticity across the three levels of production system development in 1981. In contrast, the correlation between production system development and level of automaticity in 1973 was .64.

The pattern of results described above confirms the Abernathy and Utterback model for highly developed production systems. However, some qualifications are necessary in describing production systems that are not well developed. Perhaps because of the programmable nature of new production technologies, process innovation seems to peak prior to introduction of mass production. Thus, some batch production operations may now be innovative in processes as well as products (Hull & Collins, 1987). Programmable

FIGURE 3
Standard Scores for Automaticity
by Level of Production System Development



*p <.05
**p <.01

automation technologies, such as computer-aided manufacturing in small batch operations, may have altered the time-honored principle that manufacturing facilities must be large and specialized to automate (Utterback & Abernathy, 1975).

A few of the organizations with highly developed production systems actually had lower automaticity scores in 1981 than they had in 1973, perhaps because they experienced diseconomies of scale (Abernathy & Wayne, 1974; Sahal, 1981). For example, a highly developed plant employing a continuous process technology had the highest automaticity score (800) in 1973. This plant cut back production of its slow-selling, marginally profitable commodity product and began producing pesticides using batch technologies that did not require high levels of automation. The change resulted in a net reduction of 64 percent in automaticity; to date, much of the highly automated chemical process equipment in the plant remains relatively idle. Three other plants also experienced net reductions in levels of automaticity, usually to introduce new, more profitable products.

A Test of the Theory

Table 3 gives results of the moderated regression analysis that tested our theoretical model of how social and technical factors affect process innovation, as measured by change in automaticity. The entry beta, change in R^2, and F refer to the relationship between the independent variable and dependent variable at the time of entry in our stepwise regression procedure. The final beta refers to the full moderated regression equation.

Main effects. The main-effect variables explain 24 percent of the variance in change in automaticity ($F = 3.04$, $p < .01$). Of those variables, production system development has the strongest relationship with change in automaticity (entry beta = −.40). This negative beta becomes positive (final beta = .46), however, when the cross-product terms are entered in the equation, suggesting that firms with technologically advanced production systems tend to be more likely than those with less advanced systems to adopt new computerized manufacturing technologies, all else being equal. However, the change in direction may be a statistical artifact of the high

TABLE 3
Results of Moderated Regression Analysis[a]

	Change in Automaticity			
	Entry Beta	Final Beta[b]	Change in R^2	F[c]
Main effects				
Production system development	−.40	.46†	.16	9.82**
Decentralization of line-operating decisions	.23	.20†	.05	3.41*
Complexity	.16	.29*	.03	1.64†
Formalization	−.06	.02	.00	0.20
Decentralization of strategic decisions	−.03	−.03	.00	0.03
Hierarchical R^2 = .24				3.04**
Interaction effects				
Production system development × line-operating decisions	−.92	−1.28**	.10	6.70**
Production system development × complexity	.36	.42*	.04	2.91*
Production system development × strategic decisions	−.20	−.18	.02	1.26
Production system development × formalization	.28	.28	.01	0.84
Hierarchical R^2 = .16				
Total R^2 = .40				3.30*

[a] n = 54.

[b] Final betas are standardized regression coefficients for the complete regression model.

[c] F-values are F change ratios for each individual variable at time of entry. Hierarchical Fs and total Fs are for total block of main-effect variables and main-effect variables plus cross-product terms, respectively.

†$p < .10$
*$p < .05$
**$p < .01$

correlation between the cross-product terms and production system development (Table 2). Some statisticians (e.g., Edwards, 1972) have cautioned against interpreting final betas for main-effect variables when interaction terms are in an equation because correlations between the main-effect variables and the cross-product terms are typically high. Yet other statisticians (Kerlinger & Pedhazer, 1973; Maddala, 1977) have cautioned against interpreting entry betas since they are not true partial regression coefficients. On the basis of our data, including field notes and the information represented in Figure 3, we held that the entry beta accurately described the actual relationships in our sample. Thus, we concluded that organizations with highly developed production systems were generally less likely to adopt and implement new computerized technologies than were organizations with less developed systems.

Decentralization of line-operating decisions and complexity have significant, positive effects on change in automaticity (entry betas = .23 and .16, respectively). The final betas indicate that complexity (.29) has a slightly stronger positive effect than line-operating decisions (.20). These relationships are consistent with those found in other organizational studies of innovation (cf. Aiken & Hage, 1971; Beyer & Trice, 1978; Hage, 1980), even though most other studies have focused on human service or public sector organizations.

Formalization is not significantly related to change in automaticity (entry beta = −.06; final beta = .02), perhaps because of its moderately strong correlation with the decentralization of line-operating decisions (Table 2, r = .40), which in turn is correlated with change in automaticity. That interpretation would support Blau and Scott's (1962) argument that it is easier to delegate authority if rules regarding what must be done are codified. Although formalization may be important theoretically, our study supports previous findings (Beyer & Trice, 1978; Hage & Aiken, 1970) that formalization does not have a strong main effect on innovation.

Change in automaticity does not appear to be directly associated with the decentralization of strategic decisions (entry beta = −.03; final beta = −.03). One reason may be that there is a moderate relationship between the decentralization of strategic decisions and complexity (Table 2, r = .43). Thus, although professionals may demand some decision-making authority (Hage & Aiken, 1967) and apparently have it in the manufacturing plants studied, it is complexity rather than decentralization of strategic decisions that has the stronger direct relationship with innovation. Perhaps strategic decisions primarily affect changes in process automation through the development of new products, a relationship that our study did not take into account. Collins (1986) found, for example, a significant, positive path coefficient between strategic decentralization and number of patent applications for new products; patent applications for new products were, in turn, positively associated with change in automaticity.

Interaction effects. The results of the moderated regression analyses, which are shown in rows 6 to 9 of Table 3, support our integrative theory of change in automaticity. The addition of the cross-product terms between technical development and dimensions of structure significantly increased the explained variance in change in automaticity (change in $R^2 = .16$; $F_{9,44} = 3.30$, $p < .01$). Although the overall change in the value of F supported our general theory, were our hypotheses regarding the nature of the interactions between various dimensions of structure and technology supported?

Hypothesis 1 stated that the greater the complexity, the greater the change in automaticity, especially when production system development is high. As shown in row 7 of Table 3, the regression coefficient for the cross product of complexity and production system development is positive and significant, as predicted (entry beta = .36). The final beta is also significant (.42). A comparison of the slopes in graph a of Figure 4 indicates that complexity primarily facilitates high rates of change in developed production systems. That is, complexity affects change in automaticity more strongly as production systems develop. This finding is consistent with arguments to the effect that technical experts are the gate keepers for new technologies and are employed specifically to rationalize the work-flow in advanced technical systems (Meyer, 1968; Mintzberg, 1979; Mohr, 1969; Thompson, 1967). Considering the average increase in automaticity in the plants studied, these specialists appear to have been fairly successful in furthering the development of already advanced production systems, but their direct role does not seem to have been as great when a production system was not so advanced.

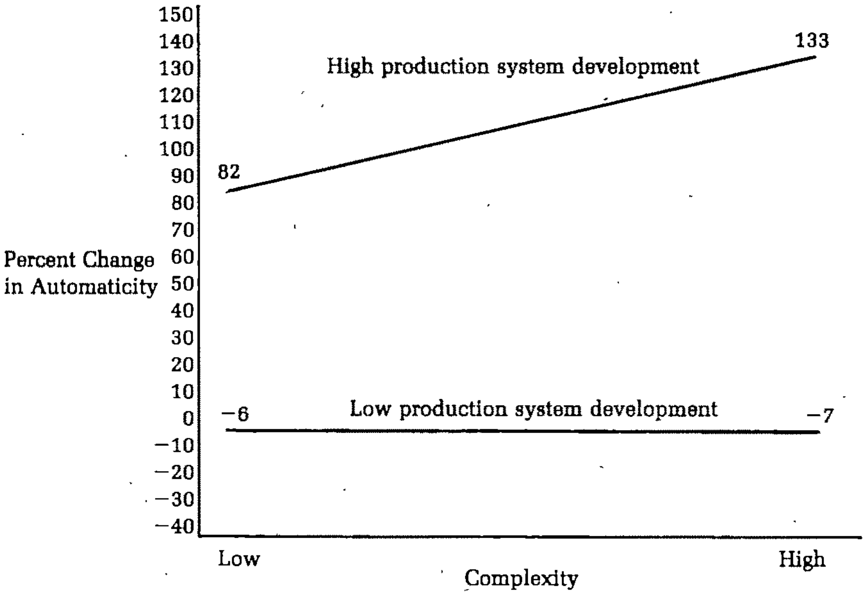
Hypothesis 2a stated that the greater the decentralization of strategic decisions, the greater the change in automaticity, especially when production system development is low. The cross product of decentralization of strategic decisions and production system development is not significant (entry beta = −.20). One reason for this is the significant positive correlation between decentralization of strategic decisions and complexity (Table 2) and the significant relationship between the cross product of complexity and production system development and change in automaticity (Table 3).

Hypothesis 2b stated that the greater the decentralization of line-operating decisions, the greater the change in automaticity, especially in less developed production systems. There is strong support for this hypothesis (entry beta = −.92). When the degree of technical development of a production system is low, the decentralization of line-operating decisions has a strong positive effect on change in automaticity (final beta = −1.28; graph b of Figure 4). On the other hand, there is a slight negative relationship between line-operating decentralization in highly developed production systems and innovation. One interpretation of this relationship is that the high level of specialization and largeness of scale of developed production systems block any potential gain due to decentralization.

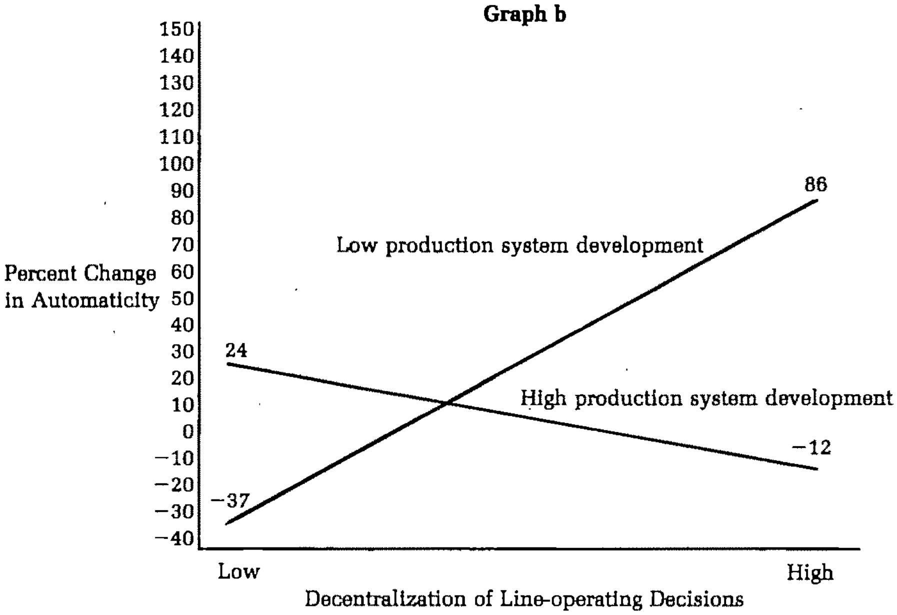
Hypothesis 2c stated that the decentralization of line-operating decisions will have a stronger effect than decentralization of strategic decisions on change in automaticity. A comparison of the entry and final betas for the two decentralization variables (Table 3) supports this hypothesis. This finding suggests that the disaggregation of the decentralization concept pro-

FIGURE 4
Change in Automaticity (1973–81) on Complexity and Line-operating Decisions (1973) by Level of Production System Development (1973)[a]

Graph a



Graph b



[a] Values are the estimated percentage change in automaticity for low and high levels of production system development and low and high values of the organizational structure variables.

vides an accurate map of its true effects on change in automaticity. Using a summative aggregate measure of decentralization, we would have averaged the effects and erroneously concluded that decentralization had a modest effect on change in automaticity, when in fact it is quite strong for line-operating decisions. The effects of centralization depend on the type of decision in question.

Hypothesis 3 stated that the greater the formalization, the less the change in automaticity, especially when production system development is low. The entry beta (.28) and the final beta (.28) of the cross product between technical development and formalization and change in automaticity are not significant. In short, formalization and production system development do not interactively affect the amount of change in automaticity.

Summarizing the results as a whole, we concluded that these data generally support our theory of how structure and technology multiplicatively affect the degree of change in automaticity. Results support three of five hypotheses: Hypothesis 1, Hypothesis 2b, and Hypothesis 2c. Production system development has both an independent effect on change in automaticity and a moderator effect on the relationship between two of the four structural variables and change in automaticity. The existence of those effects suggests that organizational studies of innovation cannot ignore the characteristics of production systems without misspecifying actual innovation processes. This finding has implications for other kinds of technology studies.

DISCUSSION

The pattern of technological change observed in these data may reflect a shift in the type of production system most likely to automate because the greatest amount of change occurred in little developed rather than in moderately developed production systems. The flexible nature of new programmable automation technologies may alter the historical pattern of technical change that has resulted in movement "towards a newer and more complex system; from unit and small batch to large batch and mass production, . . . to continuous-flow process production" (Woodward, 1965: 47; cf. Bright, 1958). Although these findings do not precisely follow the S-curve prediction made by the technoeconomists, the low rate of change in highly developed production systems is consistent with their general argument that highly developed, specialized technical systems may experience some diseconomies of scale (Sahal, 1981; Utterback & Abernathy, 1975). As a result, many organizations are discovering that there are advantages to small operations, especially over the long run (*Business Week*, 1984; Peters, 1987). Fortunately, the advent of new programmable automation technologies apparently solves the dilemma managers face regarding how to minimize costs and simultaneously remain flexible (Goldhar & Jelinek, 1983).

Issues surrounding the design and development of technical systems are among the most important decisions confronting organizations, given the long-term impact of technology on an organization's capacity for change, total dollars invested, the increasingly rapid rate of technological change, and shortened product life cycles (Naisbitt, 1983; Peters, 1987; Toffler, 1980). Our findings suggest that one avenue for initiating technological change is to begin by restructuring an organization to account for the technological parameters of its extant production system. Practically speaking, it may be possible to change highly developed production systems by investing in a highly skilled work force of professional and technical employees. For example, the mass production systems in our sample had close to half the number of professional-technical employees as batch operations, yet a high proportion of professional technical workers was more important for technological change in advanced production systems than in less advanced production systems. That pattern suggests that one avenue for overcoming some of the inherent difficulties of changing advanced production systems is to employ proportionately more process specialists. Doing so may increase labor costs in the short term, but the long-term benefits may make it a good investment.

Decentralizing line-operating decisions in highly developed production systems did not have the same positive effect on change in automaticity as did the proportion of professional-technical workers. Because highly developed production systems have relatively large scales of operations, operating decisions are relatively more decentralized in them than they are in less developed systems; yet the decentralization of operating decisions had a much stronger effect on change in automaticity in the less developed production systems. There is also little empirical support for increasing process innovation by simply decentralizing all types of decisions.

To the extent that technical and social systems interact to affect rates of change, we must adopt a fine-grained approach to innovation theory. Like Hall (1962, 1963), Pugh and colleagues (1968), and Reimann (1973), we found that the effects of various dimensions of organizational structure vary as a function of context. Reimann wrote, for example, that business organizations "may operate successfully with various degrees of structure along several independent dimensions" (1973: 469). Thus, we contend that in so far as change in automaticity is concerned, the general organic imperative, which states that the more organic the structure, the more innovative the organization, is a useful heuristic device but too general to explain what actually occurs in manufacturing organizations. For example, to the extent that our findings are valid, we now know that decentralizing line-operating decisions does not uniformly increase the likelihood that an organization will become more innovative in its production technologies (see Figure 4, graph b), as traditional structural-contingency innovation theory suggests (Burns & Stalker, 1961; Zaltman et al., 1973). Therefore, process innovation is possible in a variety of contexts.

Our findings provide further support for considering interaction effects in organizational studies of innovation (Moch & Morse, 1977). Perhaps due to Burns and Stalker's (1961) influence on structural-contingency theory, some organizational studies of innovation have specified a matching interaction model (for a review, see Zaltman et al., 1973). In fact, there is little support for a true matching form of interaction when structural and technological variables are used to predict innovation (Hull & Hage, 1982; Moch & Morse, 1976). There is no a priori reason why all contextual and organizational variables must have the same form of interaction (Schoonhoven, 1981; Van de Ven & Drazin, 1985). Instead, future research must develop middle-range theories that carefully specify the form of interaction for specific sets of variables (Downs & Mohr, 1976; Pinder & Moore, 1979).

Organizational theory is increasingly attentive to changes in events over time that lead to fundamental transformations of organizational forms and processes (Clark, 1985: 35; Kimberly, Miles, & Associates, 1980; Pugh & Hickson, 1976). Life-cycle theories of organization illustrate a concern with unique transformations in organizational forms as organizations evolve. In this vein, our data suggest that current theories of innovation, as well as theories of organization and technology, may be temporally bound rather than temporally transcendant because of the characteristics of the new microelectronic technologies. For example, programmable automation may so change the relationship between technology and structure that relationships based on hard automation may not hold in organizations using programmable automation. Until such time as programmable automation technologies are widely diffused, it may be necessary to develop theories that are based on whether programmable or conventional hard automation is employed. This topic warrants further investigation, since it may have important implications for organizational theory.

The data reported here highlight the importance of an integrative approach to organizational determinants of change and innovation. Researchers engaged in organizational studies of innovation may no longer unintentionally ignore one class of variables at the expense of other important variables like organizational structure or technology. An integrative approach to innovation may help decision makers begin to redress the innovative malaise in manufacturing establishments by suggesting viable solutions that acknowledge some of the interdependencies of human, knowledge, and mechanical systems.

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APPENDIX

Change in automaticity, the difference between the 1981 automaticity score and the 1973 automaticity score, divided by the 1973 automaticity score, was based on Amber and Amber's (1962) scale of automaticity, which indicates the extent to which machines replace human energy, dexterity, diligence, judgment, and evaluation of the manufacturing process. The scale's five basic orders of automaticity are (1) powered machines and tools, (2) single-cycle automatic machines, (3) automatic repeat-cycle machinery, (4) automatic feedback machines, and (5) computer-controlled machines. Each level reflects a qualitatively distinct type of automation.

The proportion of machinery at each level was geometrically weighted to capture true differences in output capacity, capital investment, power costs, and labor reductions associated with each level of automaticity (Hull & Collins, 1987). We summed weighted proportions to obtain an overall automation score. Automaticity scores can range from 100 for 100 percent hand-powered tools to 1,600 for 100 percent computerized machinery. Maximum scores were 800 in 1973 and 795 in 1981. This scale did not impose an artificial ceiling on actual automaticity scores. Change in automaticity correlated +.46 with estimated total dollars of plant capital investments from 1973 to 1980, and +.33 with the raw number of computer-based machines in use during 1973–80.

Production system development was the sum of five technology variables, standardized and weighted according to their respective factor loadings, which were based on principal component analysis. The variables were Woodward's (1965) technical complexity scale, the percentage of mechanical material transfer devices; work-flow rigidity (Hickson et al., 1969); machine automaticity in 1973 (Amber & Amber, 1962) and percentage of sales of standardized products (α = .79). Including automaticity in the production system development index accounts for the fact that plants start with different base levels of automaticity, an important provision since plants with high levels of automaticity may have little tendency to automate further. Of the 54 cases, 52 had complete information on all the technology variables.

Complexity was the percentage of professional and technical employees at a plant (Hage, 1980; Hage & Aiken, 1967). Chemists, designers, engineers, scientists, personnel specialists, computer programmers, draftsmen, junior scientists, and technicians were included (United States Bureau of the Census, 1975). Those categories reflect high levels of substantive skill and education (Duncan, 1961; Roos & Treiman, 1980).

Decentralization was measured on the basis of the administrative level at which action could be taken by employees without consultation with superiors (Blau et al., 1976). Responses were coded into standardized levels: 0 = above the plant's highest executive; 1 = shared by levels 0 and 2; 2 = the plant's highest executive; 3 = shared by levels 2 and 4; 4 = administrator reporting to highest executive; 5 = shared by levels 4 and 6; 6 = administrators located between level 4 and first-line supervisors; 7 = shared by levels 6 and 8; 8 = first-line supervisors; 9 = shared by levels 8 and 10; and 10 = workers. Thus, 0 equals high centralization and 10 equals high decentralization.

Principal components analysis indicated two primary types of decision making: strategic, which consisted of authority over types of output, new product development, selecting suppliers, and production volume, and line-operating, which included allocation of production work, hiring new workers, and promotion of workers (Collins, 1986; Hull & Collins, 1987). The zero-order correlation of the two variables was .20.

Formalization was the sum of nine dichotomous questions on whether a plant had an organizational chart, more standard operating manuals than the average plant in the sample (scored 1 for more than average), written operating instructions, written job descriptions for blue-collar workers and for first-line supervisors, and statistical performance records for blue-collar workers, nonadministrative white-collar employees, first-line-supervisors, and top management.

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STRATEGIC PROCESS AND CONTENT AS MEDIATORS BETWEEN ORGANIZATIONAL CONTEXT AND STRUCTURE

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A series of LISREL analyses showed that aspects of the strategy-making process and the content of business strategies mediate between organizational context and structure. One dimension of context, chief-executive-officer need for achievement, influences the intended rationality of the strategy-making process, which in turn influences structural formalization and integration. Another aspect of context, environmental uncertainty, relates to strategic product innovation, which in turn influences structural centralization and formalization. Finally, strategic process and content were shown to be related in a manner that orchestrates their mediation between context and structure. We suggest that the latitude for strategic choice causes context and structure to be indirectly and somewhat loosely coupled.

The thrust of much research on formal organizations is that context influences structure. Specifically, investigators have said that organizational size, technology, and environmental uncertainty have a profound impact on structural centralization, formalization, and integration (Blau & Schoenherr, 1971; Duncan, 1973; Thompson, 1967; Woodward, 1965). Unfortunately, there remains much confusion and contradiction in the literature, and no consensus has emerged concerning the relative ability of these context variables to predict structure (for reviews see Jackson & Morgan, 1982; Mintzberg, 1979; Singh, 1985).

Miller and Dröge (1986) further challenged that body of research, showing that, in small firms, the personality of the chief executive—specifically, his or her need for achievement (McClelland, 1961)—was a far more important predictor of organizational structure than were environmental uncertainty or technology. Unfortunately, Miller and Dröge said little about the *reasons* for those findings.

This research extends and integrates the work of Miller (1987, 1988) and of Miller and Dröge (1986) by exploring those reasons. It attempts for the first time to build and test a causal model that integrates constructs of chief-executive-officer (CEO) personality, environment, structure, strategy process, and strategy content. Because CEO personality has been shown to have the greatest impact on structure in small firms (Miller & Dröge, 1986; Miller & Toulouse, 1986) our present hypotheses, data, and findings pertain only to such organizations.

GUIDING NOTIONS

The thesis of this research is that both process and content dimensions of strategy intervene—that is, cause an indirectness and lack of one-to-one correspondence—between context, including CEO personality, and structure. Miller and Dröge (1986) never considered these intervening constructs, but they may be central in explaining their study's findings. Although the term "context" is broad and ambiguous, we define it as the challenges and resources, economic as well as human, that surround an organization. Context usually represents a broad field of constraints, opportunities, and possibilities. Executives will therefore chose from among a number of viable strategies and strategy-making processes within any context (Child, 1972; Hrebiniak & Joyce, 1985; Miles & Snow, 1978; Miller & Friesen, 1984; Porter, 1980), adopting those that not only suit their environments but also reflect their personal motives, predilections, and capabilities (Child, 1972; Hrebiniak & Joyce, 1985). But having chosen from among the set of suitable and comfortable strategic and process options, executives may find that the range of structures that can be used to support and implement those options becomes limited. Different strategies require different structures (Miller, 1988; Snow & Hrebiniak, 1980), as do different modes of strategy making (Mintzberg, 1973). Indeed, structures respond to the particular control and coordinative problems created by the strategies and strategy-making processes that are ultimately selected (Nelson & Winter, 1982). Although they can ultimately constrain strategies and strategy making, structures are often devised in response to the latter (Chandler, 1962; Rumelt, 1974). Finally, strategic content and process may themselves be related so as to make consistent their mediation between context and structure. This research explores three related themes concerning that mediation.

First, CEO need for achievement may relate to structure not directly, as claimed by Miller and Toulouse (1986) and Miller and Dröge (1986), but through its influence on strategy-making process. CEOs with a high need for achievement wish to ensure orderly and controlled progress toward their objectives. They thus try to make decisions in an intendedly rational way, doing much analysis, and consulting frequently with other managers to improve their chances of success. Those activities may in turn create a need for structural integration devices to promote consultation and for specialization and controls to provide the expertise and information needed for analysis (Fredrickson, 1986).

The second research theme has to do with the moderating effects of strategic *content*—specifically, product innovation—on the relationship between environmental uncertainty and structure. Environmental uncertainty is sometimes associated with strategies of product innovation (Miller, 1988). But because there is latitude for strategic choice and more than one way to deal with an uncertain environment, that association is not inevitable. In turn, innovation can influence structure through the technical and coordinative tasks it presents. Perhaps that is why the predictions of the contingency literature (Burns & Stalker, 1961; Lawrence & Lorsch, 1967; Thompson, 1967) concerning relationships between uncertainty and structure are not always borne out (Miller, 1988; Miller & Dröge, 1986). The relationships between uncertainty and structure may be weak because they are indirect and because different strategies with differing structural implications can be used to deal with uncertainty (Child, 1972; Hrebiniak & Joyce, 1985).

The third theme of the present study is that strategy-making process and content, the two mediating constructs, are themselves closely interrelated. Innovation calls for highly analytical and interactive—that is, intendedly rational—strategy making, and such strategy making in turn creates many perceived opportunities for innovation.

The following sections of the paper develop each of the three themes, specifying the relationships to be tested using LISREL causal modeling.

THE MEDIATING EFFECTS OF THE STRATEGY-MAKING PROCESS

The first theme of this research is that CEO personality, specifically, need for achievement, will influence organizational structure, not directly, but through its impact on the strategy-making process. The theme comprises three propositions relating (1) need for achievement to the strategy-making process, (2) process to structure, and (3) need for achievement to structure.

CEO Need for Achievement and the Strategy-making Process

There are, of course, many ways to describe personality. But we chose to study McClelland's (1961) need for achievement, which he called nAch, as it is one of the most exhaustively explored and predictive variables of personality (Gilmer & Deci, 1977) and because it has been said to have much impact on structure (Miller & Dröge, 1986) and on strategy making (Miller & Toulouse, 1986; Wainer & Rubin, 1969).

Need for achievement gauges a person's need to meet standards of excellence, to accomplish difficult tasks, and to attain success. It results in a way of life and basic attitudes and is not a simple, temporary drive. Atkinson (1958), McClelland (1961), and Wainer and Rubin (1969) suggested that those with a high need for achievement desire much control over events affecting them. Chief executives possessing this quality are thus very likely to centralize decision-making power—to keep it firmly within their own hands. As Miller and Dröge (1986) argued, this is likely to create a *direct* relationship between need for achievement and structural centralization.

But the first major thesis of this research is that the means by which a CEO's need for achievement exerts its effect on structure is often *indirect*; it works through the strategy-making process. McClelland (1961) found that those with a high need for achievement try to accomplish their objectives in an orderly and systematic way, demanding much concrete feedback on their performance and seeking through probing and consultation to reduce risks to a very moderate level. Thus, need for achievement can greatly affect information processing—the analytical and interactive aspects of intended rationality—in strategy making.[1]

Top executives with a high need for achievement are expected to perform both highly *interactive* and very *analytical* strategy making. Analysis is the structured deliberation that goes into decisions—the systematic effort and thoroughness devoted to uncovering and assessing strategic problems and opportunities (Miller & Friesen, 1984). Interaction describes managers' collaborating with and consulting one another to ensure enlightened and consistent decisions (Mintzberg, 1973). Typically, analysis and interaction are strongly related and may serve as components of a single rationality dimension.

To increase their sense of control and to reduce risks, CEOs with a high need for achievement pursue rationality in strategy making by thoroughly analyzing threats and opportunities and stimulating interactive decision making, mainly in quest of orderly and steady progress. At the same time, achievers centralize power: interaction is likely to take the form of discussion and consultation rather than of democratic choice. In short, we expect *need for achievement to exert a positive, direct influence on both strategy-making rationality and structural centralization* (Proposition 1).

It is important to note that our propositions are not individual hypotheses but part of a unified causal model that is tested using LISREL analysis (Jöreskog & Sörbom, 1984).

Strategy-making Process and Structure

Organizational structure can be described in many ways. Several reviews (Champion, 1975; Fredrickson, 1986; Hall, 1977; Van de Ven, 1976) have indicated formalization, integration, and centralization to be among the most consistent dimensions of structure to have emerged from empirical research over the last two decades. Moreover, Miller and Dröge (1986) found that the risk aversion and drive for control of CEOs with a high need for achievement led them to favor formalized, integrated, and centralized structures, confirming the relevance of those constructs for this research.

In a recent study, Miller (1987) found that intended rationality in strategy making—analysis and interaction—may require formalized and integrated structures but not centralized structures.

Fredrickson (1986) and Miller (1987) argued that rationality may have strong associations with three aspects of *formalization*—namely, controls, specialization, and the use of formal policies and procedures. These relationships seem sensible. Analytical activity and the scrutiny born of consultative interaction prompts the gathering of detailed information for assessing strategic decisions, the consequent use of formal controls and budgets (Bower, 1970), and the recruitment of specialists who can inform intendedly rational decision making (Allison, 1971). Conversely, formal controls and specialists can themselves highlight problems and opportunities that promote further analysis and interaction (Fredrickson, 1986; Steiner, 1969).

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[1] This rationality can be spontaneous and flexible and is not to be confused with Mintzberg's (1973) formalistic and mechanized planning mode of strategy making.

Miller (1987) found that the rationality dimensions of analysis and interaction were especially strongly related to the use of structural *integration* devices such as task forces and committees. Such devices provide a forum for discussions among managers, allow the generation of novel ideas through the participation of executives with different backgrounds, and thereby promote thorough and multifaceted assessments of problems, proposals, and projects.

Fredrickson (1986) argued that rationality may be associated with the *centralization* of authority. Decentralization avoids taxing the cognitive limitations of a CEO by giving power to decision makers with specialized expertise, thus freeing the chief executive for deliberations concerning strategic matters. We suspect, however, that in small, undiversified firms the administrative task will be simple, so that decentralization will not be needed for rational, well-informed decision making. In summary, *strategy-making rationality will relate positively to structural formalization and integration, but not to centralization* (Proposition 2).

A corollary proposition implies that direct links found between personality and structure may be spurious. Specifically, *the direct positive relationships of CEOs' need for achievement with structural formalization and integration will be nonsignificant given the relationships postulated in Propositions 1 and 2* (Proposition 2a). This is because a CEO's personality will have a direct impact on the way he or she makes decisions. The style of decision making then promotes the structure that can best facilitate it. In other words, personality influences behavior that requires a particular structural context.

The mediational role of strategy making does not decide the question of the direction of causality between strategy making and structure. Although analysis and interaction (intended rationality) can require much formalization and integration (Bower, 1970), those dimensions of structure may in turn prompt or, at least facilitate, rational decision making (Fredrickson, 1986; Mintzberg, 1973). Both possibilities are investigated in this study's analyses.

THE MEDIATING EFFECTS OF STRATEGIC CONTENT

Most contingency theorists (Burns & Stalker, 1961; Duncan, 1973; Lawrence & Lorsch, 1967; Thompson, 1967) have argued that environmental uncertainty—defined as change and unpredictability in technology and in customer and competitor behavior—can have a major impact on structure. The empirical evidence has not strongly confirmed that argument (Miller, 1988; Miller & Dröge, 1986; Mintzberg, 1979: Scott, 1981: 57–101), eliciting the second major theme of this study: The nonsignificance of the relationships between uncertainty and structure may be caused by the mediation of business strategy between the two (Child, 1972; Miles & Snow, 1978; Miller & Friesen, 1984).

Miles and Snow (1978) and Miller and Friesen (1984) showed that there are many relationships between environmental uncertainty and strategy. Other researchers (Hofer & Schendel, 1978; Miller, 1988; Zaltman, Duncan, & Holbek, 1973) have established that there are close links between strategy and structure. So some indirect relationship between uncertainty and structure is indeed possible. However, its indirectness and the indeterminacy that strategic choice confers upon its component links will weaken it. As firms can survive in the same environment with different strategies (Child, 1972; Hrebiniak & Joyce, 1985; Miles & Snow, 1978; Miller & Friesen, 1984), there is no one-to-one mapping between these constructs. This theme comprises three propositions relating (1) environment to strategy, (2) strategy to structure, and (3) environment to structure.

Environment and the Strategy of Innovation

Previous investigators (Burns & Stalker, 1961; Hage & Aiken, 1970; Miles & Snow, 1978; Miller, 1988) have argued that one strategy dimension having very strong relationships to environmental uncertainty is product innovation. Product innovations are most prevalent and useful in uncertain environments in which competing products or customers' preferences alter significantly (Bylinsky, 1978; Miller, 1988; Mintzberg, 1979: 270–272). They are usually far less advantageous in stable and predictable environments where customers want low prices more than novelty (Miller, 1988). In such settings, firms rarely recoup the costs of innovation. Thus, *there will be a direct and positive relationship between environmental uncertainty and product innovation* (Proposition 3).[2]

Innovation is not, of course, the only way of dealing with uncertainty. Firms can chose to create customer loyalty in ways that do not involve innovation (Galbraith, 1965; Porter, 1980; Scherer, 1980). They may use marketing differentiation strategies that emphasize advertising, high quality, auxiliary services, convenient distribution, comprehensive warranties, and so forth (Hofer & Schendel, 1978; Miles & Snow, 1978; Porter, 1980). Clearly, then, the latitude for strategic choice can reduce the relationship between uncertainty and innovation.

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[2] The functionalism implicit in so much of organizational contingency theory colors many of our arguments. Specifically, we sometimes suggest that relationships among the constructs exist because they are functional—that is, because they allow organizations to succeed. Indeed, much of the literature on organization and environment and on strategy and structure postulates relationships on that very basis. Unfortunately, we could not test the performance implications of our model. Although we did have data on financial performance, our own findings with this data base (Miller 1987, 1988) as well as the results of others (Lawrence & Lorsch, 1967; Khandwalla, 1977) suggest that performance is not linearly related to the constructs in our model but rather to the match among them. That relationship can only be established with subgroup analysis. But our sample was too small to test it using the LISREL methodology.

In this study, we deliberately avoided asserting that environment causes innovation or vice versa. Our argument is for bidirectional causality. Although uncertainty can stimulate innovation, substantial innovation by a firm can invite retaliation in kind from its competitors, raising the overall level of uncertainty in the environment.

Strategy and Structure

Researchers have commonly argued that the tasks and work interdependencies imposed by strategy influence organizational structure (Burns & Stalker, 1961; Lenz, 1981; Miles & Snow, 1978; Thompson, 1967). A strategy of innovation invokes reciprocal interdependencies among functional specialists in marketing, production, and R&D (Zaltman et al., 1973). Such interdependencies generally require the use of sophisticated integrative devices (Galbraith, 1973; Thompson, 1967). Managers from many departments must meet face-to-face to deliberate on the many nonroutine and intricate manufacturing, marketing, and financing problems entailed by novel designs and new markets. Innovation also imposes administrative complexities that require the delegation of authority to experts in a firm, increasing the decentralization of power (Burns & Stalker, 1961; Hage & Aiken, 1970; Zaltman et al., 1973). Finally, innovation requires a high degree of role specialization because experts in different functional areas are needed to perform a broad array of innovation-related tasks in R&D, engineering, and marketing (Burns & Stalker, 1961; Hage & Aiken, 1970; Khandwalla, 1977). All these structural devices might be superfluous and thus rare in firms performing little innovation. Unchanging product lines permit simple and routinized tasks, allow few face-to-face integrative devices, experts, and specialists, and encourage centralization (Burns & Stalker, 1961; Mintzberg, 1979: 431–455; Thompson, 1967). Thus, *strategic innovation will correlate directly with formalization and integration and inversely with centralization* (Proposition 4).

Although product innovation has implications for structure, structure can also constrain innovation. Complex innovation projects cannot be successfully pursued in highly centralized, unspecialized, and bureaucratic structures (Burns & Stalker, 1961; Zaltman et al., 1973). Such structures overburden CEOs, affording them too little time or assistance to initiate complex projects of innovation (Thompson, 1961). The absence of appropriate specialists restricts the expertise available for the execution of complex new designs. A paucity of integrative devices reduces face-to-face collaboration and consultation across functional departments, exacerbating the coordinative problems and conflicts that arise during the implementation of new products and processes (Galbraith, 1973; Rogers & Shoemaker, 1971; Tushman, 1982: 349–361). Again, both causal directions should be investigated.

To summarize, the overall model predicts a statistically significant relationship between uncertainty and innovation and an impact of innovation on structural formalization, integration, and centralization. However, given the option of strategic choice and the mediation of strategy between uncertainty and structure (Propositions 3 and 4), we expect that *the direct relationships of uncertainty with structural formalization, integration, and centralization will be nonsignificant in the overall model* (Proposition 4a).

RELATING STRATEGY-MAKING PROCESS AND CONTENT

The more a firm engages in significant product innovation, the more complex its decision-making task and the greater the incentive for information processing in the form of analysis and interaction (Galbraith, 1973; Thompson, 1967; Utterback, 1982). The more analytical and interactive the strategy-making process, the greater the possibility of discovering opportunities for innovation and the more effective the process of resolving the problems of design and implementation that innovations create. We hypothesize that both innovative strategies and intendedly rational strategy making have similar relationships with structure, coordinating and thus reinforcing their mediation.

Complex product innovations create special administrative problems. Customer and competitor reactions must be anticipated, novel design and engineering problems solved, and marketing, production, and financing issues dealt with. These problems are not normally amenable to quick, intuitive decision making and require regular interaction and systematic analysis among managers with diverse expertise (Tushman, 1982; Utterback, 1982). For example, product design changes have to be evaluated from marketing, engineering, and production perspectives. Such changes influence all corresponding functional areas, and thus the functional areas are likely to want to influence the changes. The resultant collaboration and consultation may stimulate the search for information, the discovery of new problems and opportunities, and a thorough and multifaceted generation and evaluation of alternatives.

In contrast, when there is little innovation, a firm can adhere to the same product lines, manufacturing processes, and marketing practices year after year. Operations function almost automatically when change is rare, evoking little managerial interaction—standard procedures generally suffice. Here decisions are usually simple and routine, mainly involving small changes in production, packaging, and distribution. They can thus be made quickly and intuitively, within a particular functional area and without much analysis or consultation.

If innovation can influence strategy making, the latter can also influence innovation. For example, analysis can induce decision makers to scan their environment, poll customers, and examine the behavior of competitors. Those activities may generate ideas for new products and processes (Aguilar, 1967; Cooper & Schendel, 1976; Rogers & Shoemaker, 1971; Wilson, 1966). Similarly, consultative, collaborative decision making often promotes creativity as the exchange of diverse points of view suggests novel courses of action (Khandwalla, 1977). Again, causal modeling has to be used to examine the direction of these relationships. In summary, we propose that *product innovation and decision-making rationality will be positively and reciprocally related* (Proposition 5).

SUMMARY

Figure 1 summarizes the theoretical model, presented in the form of a causal diagram. Its links are as follows: First, a chief executive's need for achievement is expected to have a positive, direct effect on the intended rationality (analysis and interaction) of the strategy-making process and on centralization of authority (Proposition 1); rationality is in turn expected to increase structural integration and formalization (Proposition 2). (For completeness and testing purposes, we included a negative relationship between rationality and centralization in the model, even though its potential significance was doubtful.) Second, we expected environmental uncertainty to influence product innovation (Proposition 3), which in turn was expected to increase structural formalization and integration and decrease centralization (Proposition 4). Third, we expected mutual relationships between strategic process and content, that is, between rationality and product innovation (Proposition 5). Finally, because many studies have found a positive relationship between firm size and structural formalization and integration and a negative relationship between firm size and centralization (cf. Blau & Schoenherr, 1971; Child, 1973; Dewar & Hage, 1978; Evers, Bohlen, & Warren, 1976; Kimberly, 1976; Miller & Dröge, 1986; Singh, 1985), we included those links in the model to make it as complete as possible and to reduce specification error.

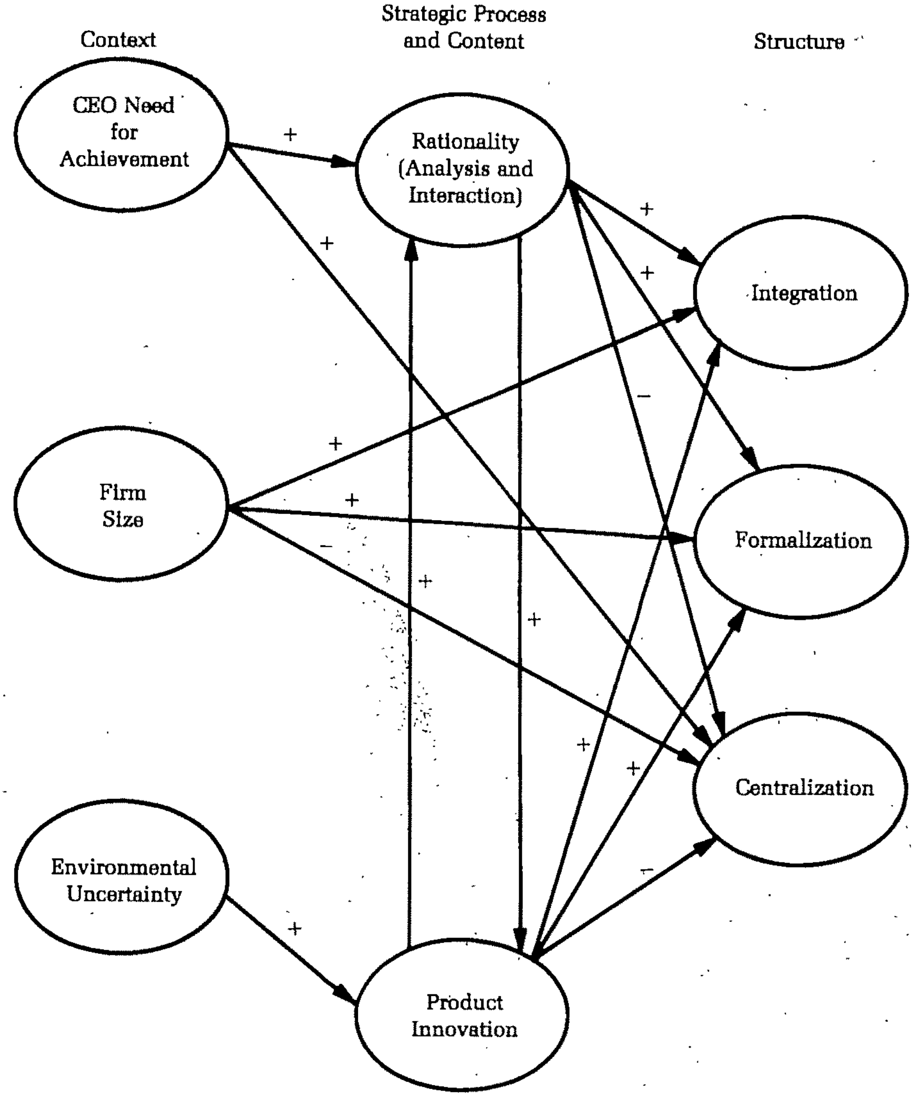
To avoid clutter and confusion, we have made Figure 1 an incomplete representation of our conjectures. It does not reflect the possible direct impact of need for achievement and environment on most elements of structure, which Propositions 2a and 4a argued against and which must be ruled out, or the influences of innovation on uncertainty, of structure on rationality, and of structure on innovation, which seemed plausible and must be tested. We will assess all those possibilities using additional LISREL models.

METHODS

Sample

Previous studies (Miller & Dröge, 1986; Miller, Kets de Vries, & Toulouse, 1982; Miller & Toulouse, 1986) have all found very significant differences between large and small firms in the relationships between CEOs' personality and structure. Therefore, to avoid nonlinearities that would rule out the use of LISREL, we used only a subsample of Miller and Dröge's (1986) 93 firms, selecting the 77 firms with 500 or fewer employees. Miller and Dröge's (1986) data base was used to assess strategy-making process and content as well as context and structure. In the firms studied, sales (mean = $9.1 million)

FIGURE 1
Strategic Process and Content as Mediators Between Organizational Context and Structure



and number of employees (mean = 111, s.d. = 99) were low. Therefore, the findings of this study may pertain mostly to small organizations.

Most of the firms were tightly held, either by an owner, a family, a group of partners, or a holding company. A great many industries were represented, including electronics, home appliances, food and beverages, financial services, lumber, construction, retailing, mining, heavy equipment, and handicrafts. No industry accounted for more than 6 percent of the total sample. Firms were selected randomly from the lists published in *Commerce* and *Les Affaires* magazines by industry sector; these lists represent a rather exhaustive inventory of significant Quebec firms by industry. The research budget limited the study to firms from the greater Montreal and Quebec City areas. Diversified firms were avoided as they may deal in multiple environments, employ diverse technologies, and differ in structure from one subunit to another. About 90 percent of the firms were run by Francophones and operated in the French language. The response rate for the subsample was 78 percent. To validate the information from the firms on strategy and environment, teams of M.B.A. students wrote case studies and compiled dossiers, including newspaper clippings, brokerage reports, and financial statements, for all the firms studied.

Questionnaire

Different parts of the questionnaire were administered to each firm's CEO and to its most senior vice president or general manager. The CEOs completed the scales on need for achievement, decision-making style, and innovation. The other executives answered the questions on environmental uncertainty and structure. Each executive was interviewed alone. The interviewers were trained to explain any possible ambiguities in the scales. By having two respondents answer different parts of the questionnaire in each firm, we were able to reduce the effects of common method variance. All scale items had been used in previous research; their sources in the literature are given in the next section.

Variables

The model shown in Figure 1 guided our choice of context variables. Size, here called LNSIZE, was measured as the natural logarithm of the number of full-time employees (Blau & Schoenherr, 1971). Uncertainty (UNCERT) was gauged using Miller and Dröge's (1986: 557) scales, which reflected the degree of change and unpredictability in market-related and technological dimensions.[3] We measured the need for achievement (NACH) of a firm's CEO using the Manifest Need Questionnaire developed by Steers and Braunstein (1976). Those authors reported on the predictive, convergent, and discriminant validities and the acceptable test-retest reliabilities achieved with this scale.

We used the same structural variables as Miller and Dröge (1986). There were three dimensions: formalization, centralization, and integration. Formalization comprised codified rules and procedures, role specialization, and the use of formal controls. It was measured using the specialization (SPEC) and formalization (FORMAL) abbreviated scales of the Aston studies

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[3] The technology dimension was not incorporated into our model because Miller and Dröge (1986) found it to be insignificantly related to our structural constructs and because we found it to bear no relationships to any of the other variables or constructs in our model (correlations are available from the first author). Also, there was no clear theoretical justification for including this variable in our analysis.

(Inkson, Pugh, & Hickson, 1970) and Miller and Dröge's (1986: 560) CONTROL scales. Centralization (CENT), the distribution of power in an organization, was also measured using the Aston scales (Inkson et al., 1970). We gauged integration, the coordinative and collaborative devices a firm used, with Miller and Dröge's (1986: 559) structural liaison variable, LIASTRUC. Strategy-making rationality was measured using Miller's (1987: 32) analysis (ANALY) scales and Miller and Dröge's (1986: 559–560) process liaison (LIASDMG) scale. Miller and Dröge used the process liaison scale to measure structural integration, but it seems to related much more closely to the interaction taking place in the strategy-making process. We measured innovation, the strategic content dimension, using five-year average expenditures on R&D as a percentage of sales (R&D) and five-year average expenditures on new product development and commercialization expenses as a percentage of sales (INNCOMM). Table 1 presents all variables' means, standard deviations, alpha reliabilities, and intercorrelations. The reliabilities were all very acceptable according to the criteria established by Van de Ven and Ferry (1979). The various designers of the scales have shown their interrater reliabilities to be very good (cf. Khandwalla, 1977: 659–663; Miller, 1983: 778).

To assess the objective validity of the measures of perceived environmental uncertainty and strategic innovation, two raters, both professors of business policy from Quebec with doctorates, read a randomly selected 15 of the most detailed case studies and newspaper-clipping dossiers that had been compiled on the firms. They were instructed to characterize environments and strategies as either high (above the median) or low (below the median) in uncertainty and innovation; the raters were unaware of the scores that executives had accorded the related scales. Raters rated each case independently, then met to resolve the single disagreement that occurred. For both variables, the raters and the executives classified firms into the same categories in 14 out of 15 cases.

LISREL Analyses

LISREL simultaneously estimates a system of structural equations that avoids the confounding of measurement and structural parameters (Jöreskog, 1978) and is therefore particularly suitable for the analysis of nonexperimental data (Bagozzi, 1977, 1980; Kiiveri & Speed, 1982). In Figure 2, the γ and β structural paths correspond to those in the theoretical model presented in Figure 1.

LISREL models latent constructs by specifying the error-in-variables measurement structure (Jöreskog, 1969, 1970). In the full LISREL model of Figure 2, the η latent endogenous variables were INTEGRATION, FORMALIZATION, CENTRALIZATION, RATIONALITY, and INNOVATION, and the ξ latent exogenous variables were ACHIEVEMENT, SIZE, and UNCERTAINTY. We specified the last three variables according to the convention of Miller and Dröge (1986), measuring them as NACH, LNSIZE, and UNCERT,

TABLE 1
Means, Standard Deviations, Reliabilities, and Pearson Correlations Among the Variables

Variables[a]	Means	s.d.	α	1	2	3	4	5	6	7	8	9	10	11
1. LNSIZE	4.28	1.00												
2. UNCERT	3.53	1.14	.74	−.02										
3. NACH	12.63	3.81		−.12	.00									
4. LIASDMG	5.32	1.21	.74	−.16	.04	.37***								
5. ANALY	4.09	1.35	.74	.04	.09	.33**	.64***							
6. R&D	3.40	3.07		−.17	.32**	.15	.25*	.27*						
7. INNCOMM	3.59	3.39		.14	.40***	.09	.22*	.14	.79***					
8. LIASTRUC	4.52	1.48	.85	.22*	.07	.32**	.75***	.63***	.25*	.13				
9. FORMAL	5.31	2.21	.65	.18	−.04	.25*	.37**	.33**	.37**	.38**	.40***			
10. CONTROL	4.83	1.28	.78	.17	−.08	.17	.18	.15	.12	.04	.21*	.52***		
11. SPEC	4.67	1.98	.80	.20*	.13	.22*	.40***	.32	.13	.15	.45***	.63***	.47***	
12. CENT	3.03	0.54	.82	−.48***	.00	.33**	.03	.07	−.16	−.07	.01	.05	.03	.14

[a] LNSIZE = size, UNCERT = environmental uncertainty, NACH = CEO need for achievement, LIASDMG = process liaison, ANALY = analysis, INNCOMM = new product expenses, LIASTRUC = structural liaison, FORMAL = formalization, CONTROL = formal controls, SPEC = specialization, and CENT = centralization.

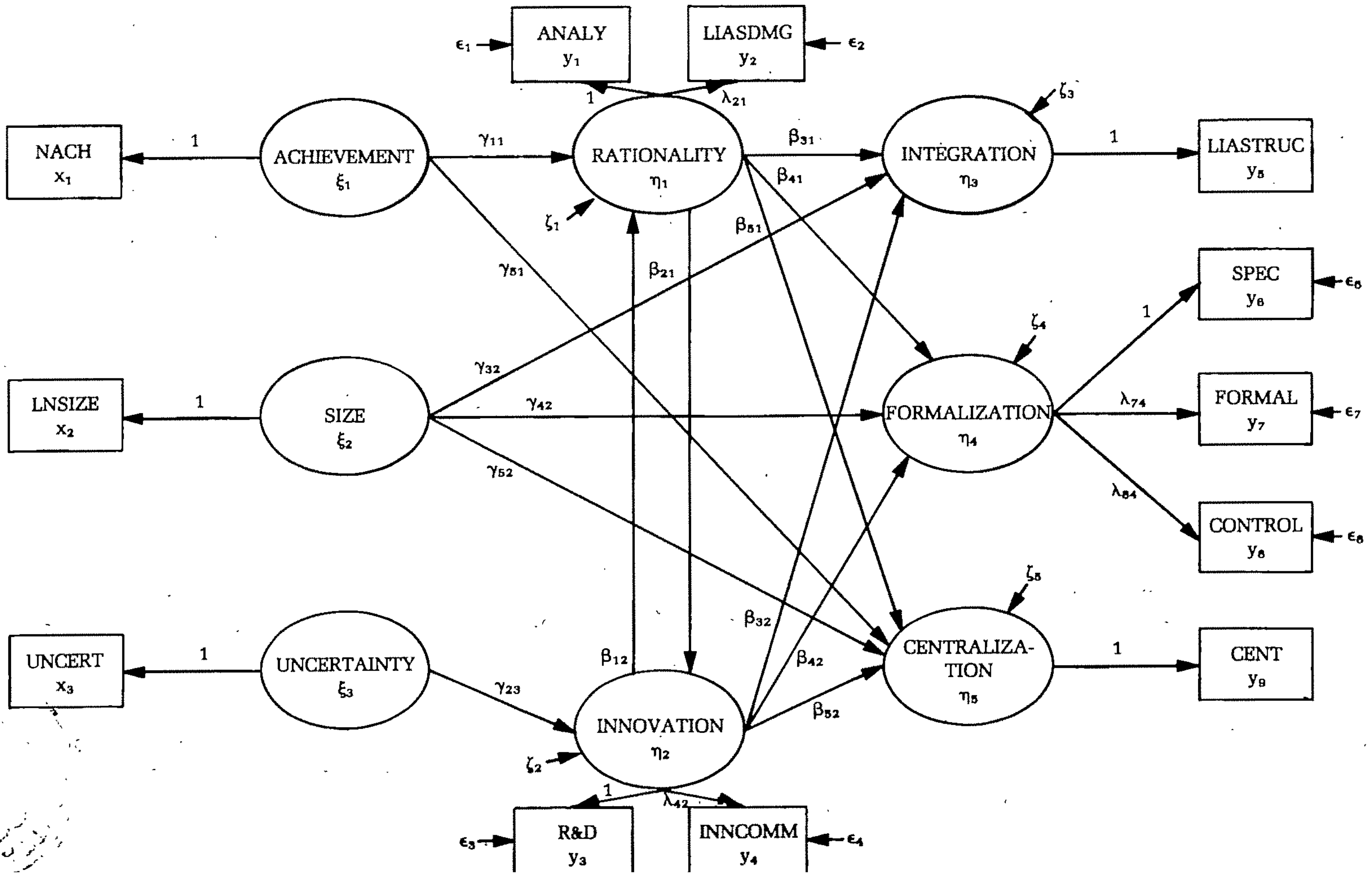
*$p < .05$

**$p < .01$

***$p < .001$

FIGURE 2

Model 1: A LISREL Model of the Mediating Effects of Rationality and Strategic Innovation



respectively. INTEGRATION was measured by LIASTRUC; FORMALIZATION was measured with error by FORMAL, SPEC, and CONTROL; and CENTRALIZATION was measured by CENT. RATIONALITY was measured by ANALY and LIASDMG, and INNOVATION by R&D and INNCOMM. To enhance the clarity of Figure 2, measurement errors specified as zero are not shown. Also, the first measurement variable of each latent construct was specified as having a factor loading of $\lambda = 1$ in order to assign units of measurement to the unobserved variables. Finally, ϕ, the variance-covariance matrix of ξ, was specified as diagonal, indicating that we did not expect ACHIEVEMENT, SIZE, and UNCERTAINTY to be significantly interrelated.

Another advantage of the LISREL approach is its hypothesis-testing capability. LISREL calculates a chi-square likelihood ratio test of the null hypothesis that the sample covariance matrix S is drawn from a population characterized by the hypothesized covariance matrix Σ. The alternative is that Σ is any positive definite matrix. Thus, a given theory is supported if the null hypothesis is not rejected. A fit of the overall model of $p > .05$ is generally considered to be adequate. It is possible, also, to test the importance of particular causal paths to the fit of the overall model by sequentially estimating a series of nested models and comparing them using a test statistic based on the differences in chi-squares (Bentler & Bonnet, 1980; Jöreskog & Sörbom, 1984).

FINDINGS

Table 2 presents the key findings of the overall theoretical model, model 1. The overall model shows a chi-square value of 49.91 ($df = 45$) having a p-value of .285, indicating a good fit with the data. It directly confirms Propositions 1, 2, and 3. Also, firm size had the expected relationships to structure. The total coefficient of determination for the structural equations was 0.596. Moreover, the composite reliabilities of the LISREL-estimated constructs were formalization = 0.680, rationality = 0.739, and innovation = 0.818, all of which were very acceptable.

It was, however, necessary to go beyond this model in order to check several issues. First, do CEO need for achievement and uncertainty have positive direct as well as indirect effects on structure (Propositions 2a and 4a)? Second, why are the relationships between innovation and rationality nonsignificant (challenging Proposition 5), and can model 1 be improved by dropping those and other nonsignificant causal paths? And third, what are the directions of influence among the principal categories of constructs? For example, does innovation influence uncertainty or vice versa? Do rationality and innovation influence structure, or is it the other way around?

Direct Versus Indirect Effects of Need for Achievement and Uncertainty on Structure

We argued that the need for achievement of a firm's chief executive would have an indirect effect on structure, predicting that it would have a positive impact on integration and formalization through decision-making

TABLE 2
Model 1: Main Results of the LISREL Analysis

Paths	Descriptions	Unstandardized Estimates	t^a	Standardized Estimates
γ_{11}	NEED FOR ACHIEVEMENT ⟶ RATIONALITY	0.224	3.357**	.425
γ_{51}	NEED FOR ACHIEVEMENT ⟶ CENTRALIZATION	0.073	2.437**	.253
γ_{32}	SIZE ⟶ INTEGRATION	0.202	1.883*	.139
γ_{42}	SIZE ⟶ FORMALIZATION	0.314	1.859*	.223
γ_{52}	SIZE ⟶ CENTRALIZATION	−0.275	−5.465**	−.505
γ_{23}	UNCERTAINTY ⟶ INNOVATION	0.893	3.055**	.349
β_{21}	RATIONALITY ⟶ INNOVATION	0.724	1.170	.250
β_{31}	RATIONALITY ⟶ INTEGRATION	1.257	6.689**	.863
β_{41}	RATIONALITY ⟶ FORMALIZATION	0.680	3.134**	.485
β_{51}	RATIONALITY ⟶ CENTRALIZATION	0.069	1.080	.127
β_{12}	INNOVATION ⟶ RATIONALITY	0.017	0.212	.048
β_{32}	INNOVATION ⟶ INTEGRATION	−0.006	−0.138	−.012
β_{42}	INNOVATION ⟶ FORMALIZATION	0.099	1.504†	.203
β_{52}	INNOVATION ⟶ CENTRALIZATION	−0.060	−2.847**	−.318

[a] The *t*-values are based on a one-tailed test.

† < .10

* < .05

** < .01

rationality rather than directly (Proposition 2a). However, we predicted (Proposition 1) a positive direct effect of need for achievement on centralization because achievers have a proclivity to hoard power (Miller & Dröge, 1986). To test those predictions, we constructed a more encompassing LISREL model—model 1a, shown in Figure 3—within which model 1 was fully nested. The former model contained causal paths from CEO need for achievement directly to structural formalization (γ_{41}) and integration (γ_{31}). As Figure 3 shows, when we dropped those direct paths from model 1a to obtain model 1, there was no significant change in the chi-square (1.02, $df = 2$, n.s.). Thus their deletion seems to be warranted (Jöreskog & Sörbom, 1984). The impact of CEO need for achievement on structural formalization and integration is thus indirect rather than direct, supporting Proposition 2a and our first major theme.

We also argued that the effects of environmental uncertainty on structure would be indirect (Proposition 4a). Again, we constructed a more encompassing LISREL model—model 1b of Figure 3—within which model 1 was fully nested. Model 1b includes causal paths leading from uncertainty directly to structural integration (γ_{33}), formalization (γ_{43}), and centralization (γ_{53}). Again, as Figure 3 shows, there was no significant change in chi-square ($\chi^2_3 = 2.97$) when those direct paths were dropped from model 1b to obtain model 1. Thus, any impact of uncertainty on structure would have to be indirect, and Proposition 4a and our second main theme are supported.

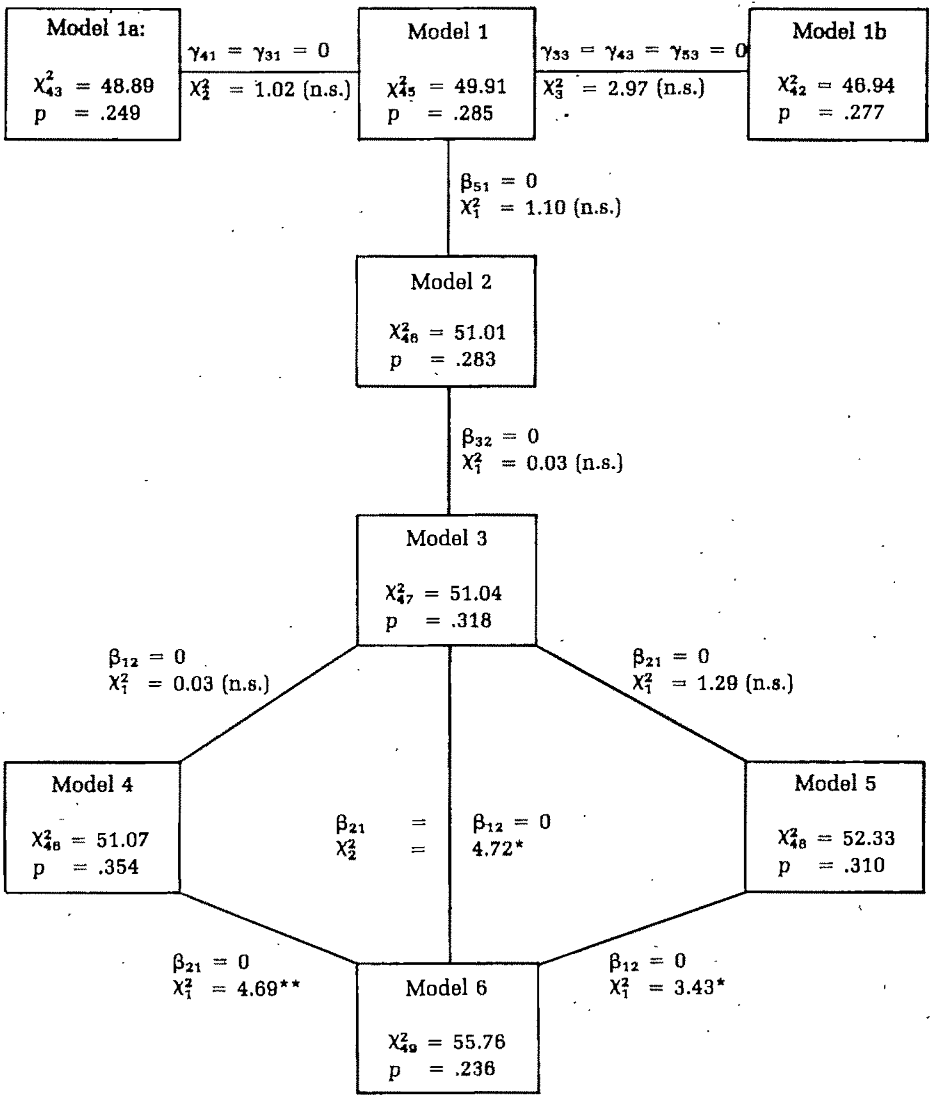
Deriving a More Predictive Model

Although model 1, our primary theoretical model, received strong support, some of its coefficients were nonsignificant. We therefore deleted them in a series of systematically nested models (see Figure 3) to determine if the more parsimonious models would fit the data even better.

We dropped the nonsignificant path from rationality to centralization from model 1 to obtain model 2 and then the link from innovation to integration from model 2 to get model 3. Neither deletion increased the chi-square statistic significantly, and the p-value increased to .318; that is, the changes improved the models. So it seemed justifiable, at least from a statistical point of view and for the sake of parsimony, to drop the paths from rationality to centralization and from innovation to integration. The nonsignificance of the first link was in fact anticipated, confirming Proposition 2. However, the nonsignificance of the second was not anticipated, calling into question Proposition 4a. We address the latter finding in the discussion.

It was surprising that the results showed the two relationships between rationality and innovation to be nonsignificant (Proposition 5) but that dropping both of those relationships from model 3 to obtain model 6 resulted in a somewhat significant (at .10) increase in chi-square and a major decrease in the p-value (from .318 to .236). To determine which of those two causal directions was critical to overall fit, we dropped each path in different sequences. From Figure 3 we can see that dropping the first, be it from innovation to rationality or vice versa, never results in significant increases

FIGURE 3
Results of the Model Nesting



* Significant at $\alpha = .10$

** Significant at $\alpha = .05$

in the chi-square statistic, as shown by the transitions from model 3 to models 4 and 5. But dropping the second—again, be it from innovation to rationality or vice versa—always results in at least a moderately significant increase in the chi-square statistic: from model 4 to model 6 at .05 and from model 5 to 6 at .10. It seems, therefore, that each path is significant in the absence of the other, although the path from rationality to innovation appears to be more significant. Possibly, a reciprocal relationship between the two constructs exists.

Thus, the analysis of nonsignificant causal paths allowed us to reduce model 1 to model 3. In conclusion, although model 1, the theoretical model, was itself highly significant, model 3, which omits two of its most nonsignificant links, fits the data better. Model 3 therefore served as the point of departure for checking possible ambiguities in the causal directions among the major categories of constructs.

Examining Alternative Causal Directions

The arguments presented at the outset indicated that structure might influence innovation and rationality and vice versa and that innovation might influence environmental uncertainty. Although we tentatively favored the causal directions contained in models 1 and 3, the current state of knowledge made it impossible to strongly support one direction over another.

Table 3 summarizes the effects of (1) reversing (relative to model 3) the causal directions of rationality with integration and formalization to obtain model 7; (2) reversing the causal directions of innovation with centralization and formalization to obtain model 8; (3) performing both those reversals simultaneously to obtain model 9; and (4) reversing the causal direction between innovation and uncertainty to obtain model 10.

As we can see from Table 3, models 7, 8, and 9 are inferior to model 3 and even to model 1. Compared to those for model 3, the chi-square statistics for models 7 and 9 are extremely high, and the coefficients of determination for the structural equations are low, indicating a very poor fit with the data. Also, for models 7 and 9 respectively, 8 and 12 modification indices exceed 5, and the Q-plots of standardized residuals are under 45 degrees. The two models are clearly inadequate. Although model 8 fares somewhat better, with a chi-square statistic significant at the .196 level, three modification indices exceed 5, and one normalized residual is more than 2. Moreover, neither of the causal paths from structure toward innovation is significant in this model. It seems, then, that our data support models with strategic process and content influencing structure rather than models with the reverse direction of causality.

The results are more ambiguous for model 10, which reverses the causal direction between innovation and uncertainty. This model is significant (chi-square = 50.92, $p = .322$), but it contains two modification indices over 5, and the coefficient of determination is 0.503, compared to 0.596 for the structural fit of model 3. Thus, model 10 fits the data slightly less well than

TABLE 3
Examining Alternative Causal Directions

Key Results	χ^{2}[a]	Coefficient of Determination for Structural Equations	Number of Modification Indices over 5[b]	Number of Normalized Residuals over 2 in Absolute Value
Model 3				
Causal directions as in Figure 1 except: RATIONALITY ⟶ CENTRALIZATION INNOVATION ⟶ INTEGRATION set to zero	51.04 (47) $p = .318$	0.596	1	0
Model 7				
Vis-à-vis model 3, two paths were reversed: INTEGRATION ⟶ RATIONALITY FORMALIZATION ⟶ RATIONALITY	69.45 (47) $p = .018$	0.567	8	6
Model 8				
Vis-à-vis model 3, two paths were reversed: FORMALIZATION ⟶ INNOVATION CENTRALIZATION ⟶ INNOVATION	55.08 (47) $p = .196$	0.586	3	1
Model 9				
Vis-à-vis model 3, four paths were reversed: INTEGRATION ⟶ RATIONALITY FORMALIZATION ⟶ RATIONALITY FORMALIZATION ⟶ INNOVATION CENTRALIZATION ⟶ INNOVATION	75.32 (47) $p = .005$	0.538	12	9
Model 10				
Vis-à-vis model 3, one path was reversed: INNOVATION ⟶ UNCERTAINTY	50.92 (47) $p = .322$	0.503	2	0

[a] Degrees of freedom are in parentheses.

[b] The modification index of the measurement variable FORMAL vis-à-vis the construct INNOV was 5.398. The same modification index was over 5 in all models (see Jöreskog and Sörbom, 1984: I.42, III.14–15, and III.18–20, for discussion of modification indices and residuals. In well-fitting models, the modification indices are about 5 or under, and no normalized residual is over 2 in absolute value).

model 3 but cannot be clearly rejected. Hence, the influence among innovation, strategy, and environmental uncertainty may be reversed or even reciprocal.

DISCUSSION

The LISREL analyses appeared to bear out our central conjectures, and thus those conjectures warrant little additional comment. It seems that CEO need for achievement influences strategy-making rationality, which has a significant impact on structural formalization and integration. Uncertainty of environment relates to complex product innovation, which in turn influences structural formalization and centralization. Clearly, then, strategic process and content play key mediating roles in relating context to structure.

But several questions remain unanswered. Why, for example, is it that the direction of the relationship between strategy-making rationality and innovation cannot be determined and may be reciprocal, whereas those between rationality and structure and between innovation and structure appear to be unidirectional?

The reciprocal relationship between decision-making rationality and product innovation is not hard to explain. Complex innovation requires a high level of analysis and interaction among decision makers as nonroutine design and implementation problems arise in the process of commercializing new products (Galbraith, 1973). Firms that innovate little can routinize things, becoming less deliberative in their strategy making (March & Simon, 1958). However, an opposite causal path is also plausible, since the very process of analysis and interaction can generate ideas for new products.

Although the relationship between strategic process and content seemed to be reciprocal, the relationships between process and the formalization and integration aspects of structure did not. From the LISREL analysis, it appeared that rationality influenced structure but that structure did not influence rationality. This may be because of the overwhelming importance of the personality of the CEO in small firms. As we showed, a chief executive's need for achievement has a strong impact on rationality, which in turn requires particular structural devices to support it. The impetus therefore is from personality directly to structural centralization or from personality to decision-making rationality and then from rationality to formalization and integration. Structure is molded to serve the demands of the top decision maker rather than vice versa. We anticipate, however, that things might be quite different in large organizations, where complex and rigid structures can impose constraints and acquire their own momentum, restricting or channeling contacts among employees and thereby influencing a firm's style of decision making (Fredrickson, 1986). Also, in large organizations, power may be more broadly distributed than in small organizations, so that the personality of a single decision maker will not have so much impact (Miller et al., 1982). In other words, we expect that the relationships between rationality and structure might have a different direction of causality in large firms.

The literature on policy commonly argues that strategy influences structure. Strategy, by its very nature, poses various problems of coordination and control that then have to be handled by structural devices such as centralization, divisionalization, and so forth (Chandler, 1962; Channon, 1973; Rumelt, 1974; Venkatraman & Camillus, 1984). That dynamic may operate at the individual-business level of strategy as well as the corporate level (Miles & Snow, 1978; Miller & Friesen, 1984; Miller, 1988). For example, a strategy of innovation requires delegation of decision-making power to experts at lower levels, a high degree of specialization, many face-to-face integrative devices, and so forth. Indeed, the causal direction from strategy to structure seems to be the one most often addressed in the literature and most strongly supported by our data. It is somewhat less clear, however, why structure did not seem to influence strategy, as that possibility can also be postulated. For example, a bureaucratic structure might constrain innovation (Burns & Stalker, 1961; Lenz, 1981; Zaltman et al., 1973). Again, perhaps, our finding is mostly relevant to small firms where structure can more easily be modified to fit whatever strategy coincides with the demands of the environment. In contrast, in large organizations, with many elaborate systems, tiers, and routines, strategy might be more easily changed than structure. The latter can exert a good deal of pressure, constraining, at least in the short run, the strategic alternatives that are seen as viable (Miller & Friesen, 1984).

The ambiguity of the causal direction of the relationship between uncertainty and innovation was not unexpected. There is little doubt that product innovation by a firm can lead to imitation by its competitors. The resultant competition might create a more turbulent and dynamic environment. Moreover, firms that innovate extensively often seek out niches of the market that are uncertain—those in which customers pay a premium for innovative goods or state-of-the-art technologies (Bylinsky, 1978; Lenz, 1981). In such markets, competitors also innovate, creating much change and unpredictability. In contrast, firms that rarely innovate are generally forced to complete in stable environments where the level of uncertainty is low. Thus, the level of product innovation can in some sense influence the level of environmental uncertainty that confronts a firm. But obviously, the causality can go in the opposite direction as well. An uncertain—that is, dynamic and unpredictable—environment often demands innovation to keep a firm up-to-date with competitive offerings and new customer needs (Burns & Stalker, 1961; Zaltman et al., 1973).

A final, and surprising, finding is the insignificant relationship between innovation and structural integration. It may be that, in small firms, innovations can be implemented without using formal integration devices. Informal collaboration might suffice where managers are few and in frequent contact.

CONCLUSIONS

The overall model seems to be well supported by the data. Strategic content and process appear to play a central role in relating context to structure. One of the most striking aspects of the findings is the closeness and integrity of the links among organizational constructs that are almost never studied simultaneously. Rarely do we see psychological, sociological, and strategic perspectives on organizations combined, particularly in empirical research. Yet the relationships among personality, environmental, decision-making, and strategy dimensions appear to be both plausible and significant. What better motivation for multidisciplinary research?

Another aspect of this research that is notable is its use of formal causal modeling to test complex relationships among multiple dimensions. The LISREL technique had significant advantages in assessing and demonstrating the individual and overall relationships among our various constructs. It facilitated the systematic evaluation and comparison of rather complex models and hence might be of particular benefit in multivariate research involving numerous interrelated hypotheses and compound constructs.

But there is much left to be done. First, it is important to stress that our data are cross-sectional and do not allow any strict causal inferences. Thus, the findings are tentative and await confirmation by longitudinal analysis. Second, the discussion has already emphasized that some of the findings may apply mostly to small organizations. That limitation is worth bearing in mind, particularly when the causal directions of the models are considered. Although, in this sample, rationality and innovation influenced structure, an opposite direction of causality might be equally plausible in large organizations. Thus, the range of generality of the findings has yet to be established. Finally, it would be interesting to investigate the performance implications of the results. For example, are the relationships that we discovered functional? Would they be more significant among high-performing organizations than among poor performers? Those questions all warrant further investigation.

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A CAUSAL MODEL OF LINKAGES AMONG ENVIRONMENTAL DIMENSIONS, MACRO ORGANIZATIONAL CHARACTERISTICS, AND PERFORMANCE

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An integrative model of relationships among environmental dimensions, diversification strategy, firm size, structural divisionalization, and economic performance was developed and tested using environmental and organizational data from 110 large manufacturing firms. The results suggested that among those organizations, (1) higher levels of environmental instability were associated with lower levels of divisionalization and diversification, (2) strategy followed structure, and (3) size did not mediate the strategy-structure relationship. Furthermore, both environmental instability and diversification were positively related to market-determined performance, and instability was negatively related to operating performance. The results provided support for portions of each of three models, the external control, strategic management, and inertial models.

The dynamics and performance implications of the environment-organization interface are important topics of investigation in both the organization theory and strategic management literatures. Numerous authors have proposed linkages among environmental characteristics, organizational strategy, structure, size, and performance outcomes (Andrews, 1980; Blau & Schoenherr, 1971; Burns & Stalker, 1961; Grinyer & Yasai-Ardekani, 1981; Hofer & Schendel, 1978; Lawrence & Lorsch, 1969; Prescott, 1986; Pugh, Hickson, Hinings, & Turner, 1969; Thompson, 1967). The importance of the variables of interest in the two literatures suggests the potential value of integrative research.

The potential value is not limited to the variables per se. As several authors have noted, the adequate investigation of complex issues will require complex models and methods (Miller & Friesen, 1984; Van de Ven & Drazin, 1985). Miller and Friesen suggested that past research has placed too much emphasis on minor modifications to atomistic hypotheses concerning simple relationships among small sets of variables. They suggested the need

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for research that produces a detailed, integrated image of reality through study of a large number of qualities simultaneously.

In an earlier work, Miller and Friesen (1978) called for the examination of the simultaneous relationships among strategy, structure, and environmental variables. Miller and Toulouse (1986) suggested that the appropriateness of strategies and structures depends on several contextual variables, environment being chief among those. Miller (1986) contended that relationships between strategy and structure cannot be divorced from their context. Similarly, Van de Ven and Drazin (1985) called for empirical study of organizations using a systemic approach. They suggested that the ability to understand the behavior of organizations depends on the ability to address sets of contingencies, structural alternatives, and performance criteria simultaneously and concluded that the challenge is to learn how the observed variables substitute for one another and contribute as a set to the abstract, latent concepts being studied. In summary, over the past decade and a half, many investigators have attempted to identify linkages among environmental conditions, organization size, strategy, and economic performance (Fahey & Christensen, 1986), but few have tried to examine those linkages in a systemic manner.

In response to those suggestions, this study developed and tested an initial integrative, systemic model of the environment-organization interface and associated performance outcomes. The methodology employed, structural equations analysis, allows simultaneous examination of systemic relationships among environmental and organizational variables as well as of their joint and separate influences on performance. This approach provides for the integration of both time-ordered and cross-sectional data and for the consideration of multiple dependent variables.

THEORETICAL FOUNDATIONS

Most previous work has focused on relationships between environmental and organizational variables or between organizational and performance-outcome variables rather than on the linkages among all three sets of variables. For example, Romanelli and Tushman (1986) identified three prominent models of organizational evolution: an external control model, a strategic management model, and an inertial model.[1] The relatively deterministic external control model suggests that shifts in environmental conditions over time strongly influence organizational changes. Alternatively, the strategic management model assumes that executives choose patterns and domains of competitive activity. The inertial model, in which origins of an organization's relationship to its environment determine activities over time, suggests that organizational size and structure, initially determined by environment, constrain future changes. Environment plays a critical, albeit slightly different, role in each of the three models.

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[1] The three models described by Romanelli and Tushman focus on change or adaptation over time. In this study, the focus is not on change or evolution but rather on how the models help explain the behavior and performance of a large set of organizations at any point in time. Used in that way, the models are not examined as discrete entities but rather for their contribution to an explanation of a general model of organizational functioning. Thus, we examined only parts of each model, focusing on how they contribute to the explanation of outcomes of a large set of organizations.

Much of the research underlying the three models has ignored performance, though each has performance implications. For example, Romanelli and Tushman (1986) suggested that firms that obtain good alignment with their environments tend to be high performers, a suggestion in keeping with the external control model. Further, firms that select and implement effective competitive strategies, fulfilling the strategic choice model, have high performance, creating slack that allows them to engage in diversification and reorientation as needed. Finally, in line with the inertial model, high-performing firms may, because of their performance, institutionalize activities, erecting barriers to change and thereby lowering performance in the long run.

Literature exists to support each of the models and their implications for organizational outcomes. Integration of the three streams of literature and analysis of the complex interrelationships among some of their key variables may be accomplished through the construction of a systemic model. In the present research, we drew the overall conceptual framework for the initial model construction from general systems concepts in which an organization is viewed as an open system of context (environment), process (organizational characteristics), and outcomes (performance) (Katz & Kahn, 1966). Environment consists of resources and constraints, and organizational characteristics and performance are observable results. The specific relationships developed in our model, represented in Figure 1, are derived from Romanelli and Tushman's models. The identifiers in parentheses reflect the numbered paths on the figure.

External Control: Environment

Each of the three models noted by Romanelli and Tushman considers the influence of the external environment. However, the external control model suggests that environment is the *dominant* influence on organizational actions. Although early studies focused on the impact of uncertainty on organizational structure (e.g., Duncan, 1972; Lawrence & Lorsch, 1969), later work has suggested that environment is multidimensional, with multiple and differentiated effects on a number of organizational characteristics.

On the basis of a comprehensive review of the literature, Aldrich (1979) developed a scheme of six environmental dimensions on which there is an "emerging consensus among researchers" (Dess & Beard, 1984: 54). Dess and Beard used factor analysis to collapse five of the six dimensions into a more parsimonious set of three: munificence, dynamism, and complexity. They defined "munificence" in terms of resource abundance and resulting capacity to support growth. "Dynamism" primarily reflected instability (volatility).[2]

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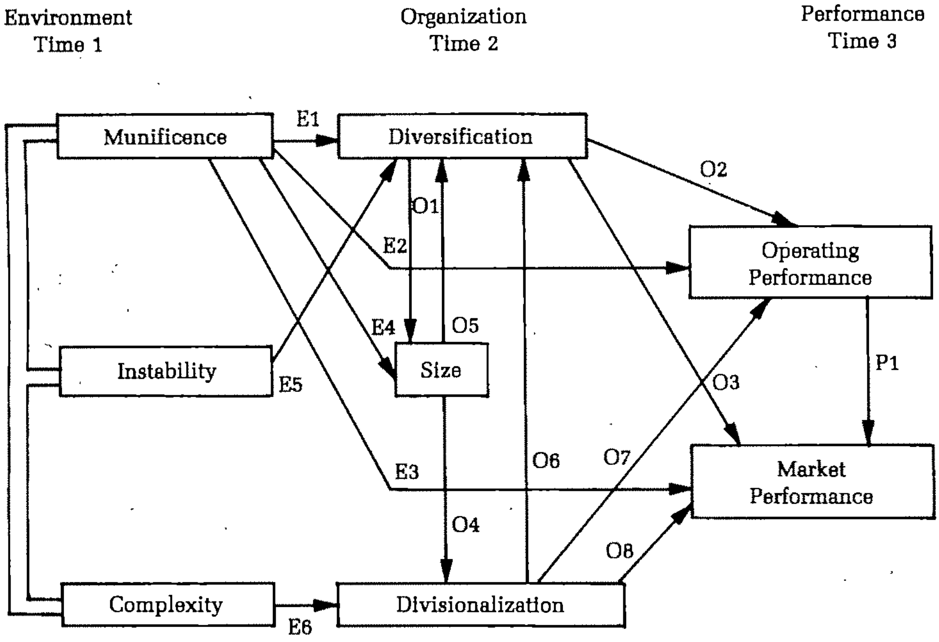
[2] Although a few measures reflecting new plant openings also loaded on this dimension, we focused on the primary dimension of instability in developing our model to maintain theoretical consistency with previous research.

FIGURE 1
General System Model of Environment–Organization Interface



"Complexity" was defined as the heterogeneity and concentration of environmental elements. Thus, these dimensions reflect a rich history of theory and research on environment and provide the basis for our environment-organization linkages.

Relative scarcity of resources in existing markets increases the risk of remaining in those markets and increases the need to expand operations into new markets to reduce dependencies on existing domains (Hannan & Freeman, 1977). Thus, firms direct diversification efforts into markets with more munificent environments in order to balance overall risk (Bettis, 1981; Thompson, 1967) (path E_1). Balancing or reducing overall risk through operation in munificent environments should enhance organizational performance, whereas performance tends to be lower in less munificent environments (Caves, 1977; Pennings, 1975) (E_2, E_3). Thus, both strategy and performance may directly and indirectly be a function of environmental munificence. Munificence may also affect organizational size. Growth is easier to achieve in resource-rich environments, as they provide opportunities for expansion in existing markets and development of new markets (Tushman, 1977) (E_4).

Environmental instability may influence a firm's diversification strategy. The unpredictable nature of volatile environments presents increased risk for organizations. A logical strategic alternative is to diversify (E_5) to spread or reduce the overall risk and maintain or improve performance (O_2, O_3). Thus, strategy and, indirectly, performance may be a function of instability.

Environmental complexity exerts its primary influence on organizational structure. MacCrimmon and Taylor (1976) and Bobbitt and Ford (1980) suggested that organizational decision makers deal with environmental complexity by structural divisionalization (E_6). Divisionalization allows development of specialized knowledge to deal with specific environmental elements and creates decentralized decision-making authority to take needed actions (Williamson, 1975).

Strategic Management: Diversification

The strategic management model suggests that through its strategy, an organization selects and interprets its environment, responds to those elements it considers fixed, and attempts to shape the remaining elements to its advantage (Bourgeois, 1980; Porter, 1980, 1985). For example, an organization may attempt to buffer itself in response to perceived volatility or low munificence in a particular domain through diversification (Miles, Snow, & Pfeffer, 1974) (E_1, E_5). Several researchers have suggested that this process will, in turn, affect the structural configuration of an organization (Chandler, 1962, Grinyer, Yasai-Ardekani, & Al-Bazazz, 1980; Rumelt, 1974; Williamson, 1975). Channon (1973), Franko (1974), Pooley-Dyas (1972), Suzuki (1980), and Wrigley (1970) all suggested a relationship between diversification and divisionalization. Others have found the relationship between diversification and structure to be weak (Hitt & Ireland, 1986). Grinyer and Yasai-Ardekani (1981) suggested that organization size mediates the relationship.

Growth in size may result from diversification, often accomplished via acquisition of other firms. That activity tends to provide rapid increases in net assets and overall sales volume (Hitt & Ireland, 1985). Increased size may exert administrative pressures on a firm's structural configuration, requiring increased decentralization and specialization of decision making. Figure 1 (O_1, O_4) reflects this set of relationships. An underlying assumption of these studies is the linkage to performance (O_2, O_3, O_7, O_8), although Bettis and Hall (1982) and Montgomery (1982) questioned that linkage.

Direct linkages between strategy and performance are assumed in this model. If firms can achieve the goals of reducing risk and selecting munificent operating environments through diversification, improved performance should result (O_2, O_3). However, prior empirical results have been mixed (Bettis, 1981; Montgomery, 1979; Rumelt, 1974). Some studies have indicated that the degree of diversification into unrelated businesses may negatively affect performance (Bettis, 1981; Luffman & Reed, 1982; Rumelt, 1974). However, Varadarajan and Ramanujam (1987) found the performance differentials between firms with very low levels of diversification and those with very high levels of diversification to be nonsignificant. Dubofsky and Varadarajan (1987) found that the highest-performing firms varied in their level of diversification. They also found that the type of relationship between diversification and performance varied with the performance measure examined. Related firms outperformed unrelated firms on accounting-based measures, but the reverse was true for market-based measures. Hitt and Ireland (1987) suggested that as organizations become increasingly diversified, they become more difficult to manage. However, Leontiades (1986) contended that if managed effectively, unrelated diversification may produce effective performance.

Inertia: Size and Structure

According to the inertial model, environment, strategy, or both may provide the primary influences on organizational action in initial stages. However, as an organization develops, the size and structure that evolve begin to exert constraints on organizational actions.

Size. The issue of organizational size has a mixed history in the literature. Some theorists have treated size as an imperative that dictated certain structural configurations, and others have focused on the relationship between size, diversification strategy, and performance. The work of Pugh and his colleagues (1969) suggested that size had a primary causal effect on certain structural variables. Blau (1970) proposed that expanding size generates increasing differentiation in an organization. Blau and Schoenherr (1971) found support for that conclusion while controlling for differences in technology and environmental conditions and concluded that size was the most important condition affecting the structure of organizations. Beyer and Trice (1979) found the relationship between size and horizontal differentiation to be indirect and the relationship between size and specialization to be stronger than the former.

Grinyer and Yasai-Ardekani (1981) found that size was correlated with both diversification strategy and structure. They suggested that firm size may mediate the strategy-structure relationship. Beyer and Trice (1979) suggested that the relationship between size and structural complexity depends on firm strategy. Thus, increased diversification may result in increased size, making a firm more complex to manage (O_1). Increased size may strain the managerial span of control, resulting in increased hierarchical levels and increasingly decentralized authority (Blau, 1970) (O_4).

Size may also affect diversification-strategy decisions. For example, Rumelt (1974) and Luffman and Reed (1982) suggested that single-business firms, which are generally smaller than diversified firms, often seek to diversify in order to grow and spread their risk across markets. As firms grow, they tend to increase their market share and enjoy economies of scale, thereby increasing their market power and organizational slack (Bourgeois, 1980, 1981). These in turn provide a firm with the ability and resources to seek further diversification (Luffman & Reed, 1982). However, Hannan and Freeman (1984) argued that inertia also increases with size. At some point, firm size may constrain further diversification moves (O_5). Further, large firms strain the structures used to manage them. In summary, the inertial model also suggests that size may have effects on both strategy and structure and, in this way, mediate the relationship between the two, as depicted in Figure 1 (O_1, O_4, O_5).

Structure. Pitts (1980) argued that structure institutionalizes strategy and thereby provides the premises for strategic decision making. Chamberlain (1968) suggested that structure and historical actions constrain firms' strategies in such a way that a "policy set," or a constrained set of alternatives from which strategists may choose, develops. That is, as a result of the structure, a cognitive framework develops that influences strategists' perceptions of information's salience and provides premises for decision making (Ireland, Hitt, Bettis, & de Porras, 1987; Prahalad & Bettis, 1986). Pitts (1980) suggested that the type of information gathered and perceptions of environmental threats and opportunities vary with degree of divisionalization. Additionally, Staw, Sandelands, and Dutton (1981) suggested that executives' commitments to established policies preclude perception of threats or need for change. Thus, structure influences strategy (O_6).

Linkages involving structure and performance in the context of the environmental and organizational dimensions have been primarily based on Williamson's (1975) M-form hypothesis. That hypothesis suggests that organizing along functional lines (the U-form) does not efficiently serve the operation of a large enterprise but that such operation is efficiently served by the M-form, which provides quasiautonomous operating divisions. Williamson concluded that the M-form is most efficient—and leads to high performance—in large, diversified firms. Thus, Williamson proposed direct linkages between structure and performance (O_7, O_8). On the other hand, Hannan and Freeman (1984) suggested that structural inertia increases as firms age. Structural inertia could have negative effects on performance if change were required. Further, Hoskisson and Hitt (1988) argued that the M-form focuses decision making on short-run outcomes and thus has led to a reduction in performance for large M-form firms (O_7, O_8).

Performance

Performance is a difficult concept, both in terms of definition and measurement. Thompson (1967) suggested that regardless of the basis for organizational assessment (efficiency, instrumental, or social tests), the important issue for organizations is preparedness for future action. Both internal and external constituencies will judge preparedness, and because of uncertainty, will typically measure it in "satisficing" terms, often based on economic-financial information. For the present integrative model, we used two dimensions of financial performance: operating performance and market-based performance, both of which provide indications of preparedness. Operating performance provides an evaluative referent and an indication of past and present organizational adaptation. Market performance provides a future-oriented consideration of an organization's ability to transform itself in the face of anticipated and unanticipated environmental challenges and thus a more long-run perspective. Although each reflects a different dimension of performance, previous research has shown them to be interrelated (Keats, 1988). Both were important for this study for several reasons.

The finance literature argues strongly that maximization of shareholder wealth (market performance) is the ultimate criterion of firm effectiveness (Johnson, Natarajan, & Rappaport, 1985; Reilly, 1979; Weston & Brigham, 1978). However, as Bettis (1983) noted, the assumptions underlying that argument ignore some of the fundamental concerns of strategic management. Furthermore, operating performance is considered an important outcome variable by both practitioners and strategy researchers (Bettis, 1981; Rumelt, 1974). Although evidence on relationships between operating and market-based performance has been mixed, we would expect announcements of a firm's operating performance to influence investors' attitudes toward the firm's stock and therefore its price. Therefore, operating performance may influence a firm's market-based performance (P_1).

Summary

Independently, each of the three models suggests dominance by one set of variables (environment, strategy, and size and structure) over another. However, the literature supports elements of all three. The model depicted in Figure 1 represents a systemic view of the relationships supported by previous research. Given the model's general systems foundation, environment is the driving force in it, as it is in the external control model (E_1, E_2, E_3, E_4, E_5, E_6). Additionally, the effects of diversification strategy on size, structure (through size), and performance suggest the importance of elements of the strategic management model (O_1, O_2, O_3, O_4). Finally, the relationships among structure, diversification, and size support elements of the inertial model (O_4, O_5, O_6). Therefore, the overall model integrates elements of all three models and their joint and separate effects on performance outcomes.

METHODS

Organizations Studied

The organizations included in the present research were drawn from Rumelt's (1978) strategy and structure data bank, which updated the sample of Fortune 500 organizations used in his original dissertation work (Rumelt, 1974). Most of the firms in the data bank (252 of 262) were in manufacturing. We excluded the few firms involved with retailing or services to maintain comparability and consistency with previous research on the relationships of interest. In addition, the firms we selected for inclusion were neither objects of merger or acquisition, nor had they exhibited a major shift in industrial or major-product-group classification over the time frame of the study. The final criterion for a given firm's inclusion was the accessibility of all relevant environmental and performance data.

The 110 firms thus selected represent a broad range of industries, all with two-digit Standard Industrial Classification (SIC) codes between 20 and 39. The sizes of the firms ranged from $162 million to $23 billion in sales (median = $1.4 billion) and from $96 million to $17 billion in net assets (median = $1 billion). The range of diversification represented is slightly more constrained than that of the entire *Fortune* 500. For 1974, Rumelt (1978) estimated the following distribution of the 500: single-business categories, 14.4 percent; dominant, 22.6 percent; related, 42.3 percent; and unrelated, 20.7 percent. In the present data set, the percentages were 11.8, 36.6, 46.4, and 5.5.

As Cook and Campbell (1979) noted, researchers are often in the position of using other than formal random samples, especially in field research or in research involving multiple large data bases. In such cases, care must be taken in making specific inferences regarding a target population. Therefore, although this data set included a broad range of large manufacturing firms representing a variety of industries, care should be exercised in generalizing the results.

Measures of Environmental Characteristics

In causal modeling terms, the environmental dimensions and organizational characteristics described in the first section reflect theoretical constructs. The measured variables described below serve as indicators for those constructs. We operationally defined the environmental dimensions in terms of the industry-classification codes assigned to each firm in Standard and Poor's COMPUSTAT files, which conform closely to the SIC codes. The use of industry as a suitable aggregate for the study of organizational actions has been subjected to and supported by critical review (Dess, 1980). Industry provides the most consistent basis for assessing attributes of task environments (Dess & Beard, 1984).

The underlying assumption of this study was that the task environment of a firm may be defined in terms of a major line of business. The literature supports that assumption (Porter, 1985) and suggests that the environment of a firm's core business becomes the dominant focus or frame of reference for most corporate-level decisions, even in firms that are diversified (Prahalad & Bettis, 1986). Thus, the environmental context of the dominant industry affects corporate-level strategies (Hill & Hoskisson, 1987; Hitt & Ireland, 1985).

The selection of indicators was based on examination of Dess and Beard's (1984) factor loadings. We adapted those variables that had strong factor loadings on their respective factors (munificence, dynamism, complexity) and relatively weak loadings on the others, thus enhancing construct validity. We obtained data for the environmental measures from COMPUSTAT tapes.

Munificence. According to Aldrich (1979), environmental capacity, which Dess and Beard labeled munificence, refers to the availability of environmental resources to support growth. Therefore, indicators for this dimension should reflect growth. Dess and Beard (1984) suggested that industry sales (or market growth) is the primary factor in environmental munificence. Following that reasoning, we designated the indicators for this dimension as average growth in (1) net sales and (2) operating income in the dominant industry over the period 1969–73. The Appendix gives detailed descriptions of all indicators.

Instability. The concept of instability refers to volatility or difficult-to-predict discontinuities in a dominant industry (Aldrich, 1979; Dess & Beard, 1984). Indicators for this dimension should not primarily reflect steady growth or predictable cyclicality, although those may have some effect on volatility (Miles, Snow, & Pfeffer, 1974). The focus is on discontinuities. Indicators for this construct were volatility of (1) net sales and (2) operating income in the dominant industry over the period 1969–73.

Complexity. The concept of complexity generally implies a consideration of the number, diversity, and distribution of task-environment elements (Aldrich, 1979; Dess & Beard, 1984). Although the particular elements selected for study may vary, the underlying assumption is that variations in their number, diversity, and distribution affect organizational information-processing requirements. In this research, we adapted the indicator for the complexity dimension for the period 1969–73 from Grossack's (1965) dynamic measure of industry concentration (described in the Appendix), which provides for comparability across a variety of diverse industry environments. The following arguments provide the rationale for this measure.

Williamson (1965), Khandwalla (1973), and Starbuck (1976) suggested that industries exhibiting high monopoly power are less complex than those exhibiting low or declining monopoly power, such as industries infused with entrepreneurial newcomers. Additionally, Porter (1980) suggested that the structural analysis of an industry should include both the number of firms in the industry and the balance among them. The presence of numerous firms in an industry or the existence of some balance among firms through similarity of size and perceived resources increases the information-processing requirements of industry members. According to Porter's framework, firms in industries with low concentration may mask their competitive moves and are likely to engage in vigorous infighting. When an industry is highly concentrated, its leaders can impose discipline and play a coordinative role. Shifts in concentration may also affect government regulation, height of entry barriers, incentives to innovate, and diversity of product lines among industry members. Thus, this indicator reflects many potential aspects of environmental complexity.

Construct Validity

As Bagozzi (1980) and others have noted, construct validity encompasses a number of issues, including theoretical and observational meaningfulness, internal consistency of operational definitions, and convergent, discriminant, and nomological validity. We adapted our environmental indicators from the work reported by Dess and Beard (1984). However, our data spanned a much broader industry base. Thus, in order to evaluate our environmental data, we drew descriptive statements about environments from the annual reports of more than one-third (39) of the firms in the data set for the five-year period on which our environmental measures were based. Then, in an independent step, two judges using the definitions of munificence, instability, and complexity classified each of the firms as high, medium, or low (Likert-type scale) on each dimension by evaluating the descriptions of the relevant industries.

We then assessed the Pearson product-moment correlations between the judges' classifications and the scores assigned to the firms on each dimension. This method was appropriate because linearly equidistant numbers were applied to the ordered categories (Havlecik & Peterson, 1977; Labovitz, 1970). The results of this analysis revealed the following correlations: munificence, $r = .59$ ($p < .001$); instability, $r = .40$ ($p < .05$); and complexity, $r = .53$ ($p < .001$). Given the lack of specificity of environmental descriptions in annual reports, obtaining reasonably strong statistically significant relationships supported the validity of the environmental measures used here.

Measures of Organizational Characteristics

As noted previously, given the present level of analysis, organizational characteristics should reflect an enterprise as a whole. Furthermore, our objective was consistency, and thus comparability, with previous policy research.

Diversification strategy. The selection of the indicator for this construct was based on the need for a strategic rather than, say, a simple product-count measure of diversification (Pitts & Hopkins, 1982). We also based selection on the need to reflect both a corporate perspective and the content of strategy. Therefore, we used Rumelt's (1974) system of diversification categories. In a partial replication of Rumelt's (1974) study, Christensen and Montgomery (1981) reported a match on 125 out of 128 *Fortune* 500 firms in their study, suggesting that the measure is reliable. Montgomery (1982) found a very strong relationship between Rumelt's measure and a continuous measure of diversification. Dubofsky and Varadarajan (1987) provided additional empirical support for Rumelt's ratio-based measure. Those findings strongly support the validity of the category system and its treatment as an ordinal variable (Grinyer & Yasai-Ardekani, 1981).

The values for this variable were obtained from Rumelt's (1978) data bank. The level of diversification for each firm as of 1974 was ranked from 1 to 10, according to the following order of categories: single business, single vertically integrated business, dominant-product vertically integrated business, dominant constrained, dominant linked, dominant unrelated, related constrained, related linked, multibusiness (a few large unrelated businesses), and unrelated portfolio (many unrelated businesses).

Size. Jackson, Morgan, and Paolillo (1986) suggested that the measure of size used should depend on the subject of an investigation. If a researcher is investigating the effect of environment, for example, size measures should include measures of firm sales and assets. Thus, in the present study, size was measured in terms of dollar sales volume and net assets for 1974. We obtained the values for those measures from COMPUSTAT tapes.

Structural divisionalization. The selection of the indicator for this construct was based on the need to consider the issue of structural complexity at the corporate level. The work of several previous investigators (Berg, 1965;

Chandler, 1962; Grinyer & Yasai-Ardekani, 1981; Lorsch & Allen, 1973; Rumelt, 1974; Stopford, 1968; Wrigley, 1970) suggested that a critical dimension of corporate-level structural complexity is the degree to which an enterprise has decentralized and specialized its decision-making processes, as reflected in its level of divisionalization. Divisionalization contains dimensions of horizontal differentiation when there are many divisions, each focusing on different product markets, and of specialization when knowledge is specialized to a particular product line. We used the structural categories, or measures of divisionalization, presented in Rumelt's (1978) strategy and structure data bank. Those categories reflect increasing complexity of structure in enterprises.

The level of divisionalization for each firm as of 1974 was scored from 1 to 5 according to the following order of categories: simple functional organization, functional organization with subsidiaries for separate products, geographic divisions, product divisions, and the highly decentralized holding company form with a small head office. This system, which is similar to the ordinal scale grounded in Wrigley's (1970) work that Grinyer and his associates used in a number of studies (Grinyer & Yasai-Ardekani, 1980, 1981; Grinyer, Yasai-Ardekani, & Al-Bazzaz, 1980), reflects both degree and pattern of corporate divisionalization.

Operating performance. The indicators for this construct included five-year (1975–79) average return on equity (ROE), return on assets (ROA), and return on investment (ROI) adjusted for risk by dividing each by its standard deviation (Bettis, 1981). Data were obtained from COMPUSTAT tapes.

Market-based performance. Indicators for this construct included five-year (1975–79) average measures of market return adjusted for market risk (Hitt & Ireland, 1985) and capital market performance (McEachern, 1975). Data were obtained from Center for Research on Security Prices (CRSP) tapes.

The performance dimensions and measures used in this study have been shown to exhibit high levels of convergent and discriminant validity (Keats, 1988). The five-year period (1975–79) used for both followed the year (1974) for which the measures of diversification, divisionalization, and size were obtained. Such a period reflects a reasonable planning horizon for the organizations studied.

Analysis

The model was constructed in terms of latent theoretical constructs and the measured variables that served as indicators of those constructs. Although two indicators in the model were ordinal variables, the general linear model is quite robust over deviations from the interval data assumption. In the present case, we applied linearly equidistant numbers to ordered categories, thereby imposing equality of distance (Labovitz, 1970). The result is similar to a Likert scale, which is often used in such analyses.

The model encompasses a ten-year time frame (1969–79) in which there was strong interest in and emphasis on diversification. The study was framed in terms of sequential time periods (environmental variables, 1969–73; organizational characteristics, 1974; performance, 1975–79). That framework provided a temporal dimension to the study, thus lending additional credibility to the causal flow of the model. We tested the model using LISREL VI (Jöreskog & Sörbom, 1984), which allowed us to address complex sets of relationships in a simultaneous fashion. The procedure generates a matrix that varies as a chi-square distribution. The chi-square assessment of fit indicates whether a hypothesized model fits the data. The degree to which the observed relationships differ from the model is an indication of the degree to which the model is a misrepresentation (see the Appendix for a description of the LISREL and additional fit-assessment indexes used).

If initial results indicate a poor fit of model to data, an iterative modification process may be used to reveal the model suggested by the data (Jöreskog & Sörbom, 1984). The result is a sequence of fully nested models. Ideally, this process would not be based solely on statistical grounds. However, as Jöreskog and Sörbom noted, in many cases theory does not provide clear guidelines regarding how a model should be changed. In this study, extant theory provided the foundation for the original model and thus would offer little direction for alteration. In such cases, Jöreskog and Sörbom suggest examining normalized residuals, Q-plots, and modification indices. The outcome of such a post hoc process would not be expected to serve as a definitive representation of all of the possible causes of the endogenous constructs. The relationships would represent the best estimate of the effects of those particular constructs on one another for the particular data set.

RESULTS

Table 1 presents correlations, means, and standard deviations for all measured variables. After an r-to-z transformation, the average intercorrelation between exogenous construct indicators was 0.12, indicating that multicollinearity was not a significant problem in the present study.

Table 2 gives the standardized structural parameter estimates for the initial solution. The footnoted values indicate parameters with statistically significant t-values obtained by dividing the LISREL coefficient by its standard error. Absolute values of t greater than 2.0 indicate a parameter that is significantly different from zero ($p < .05$).

Although some of the bivariate relationships met the criterion, overall the results indicated a poor fit of model to data ($\chi^2_{62} = 111.92$, $p < .001$; adjusted fit index = .80; root-mean-square residual = .13; see the Appendix for interpretation). Given the poor fit, we pursued the iterative process of model modification described earlier to reveal the model suggested by the data. In the resulting model, some of the relationships suggested by earlier literature did not achieve statistical significance. For example, with a standardized coefficient of $-.02$ ($t = -.06$), the relationship between size and divisionalization was one of the weakest relationships, suggesting that other forces may underlie structural divisionalization among firms in this data set. We therefore deleted the parameter.

TABLE 1
Correlations, Means, and Standard Deviations for All Variables[a]

Variables	Means	s.d.	1	2	3	4	5	6	7	8	9	10	11	12	13
Environment															
1. Sales growth	1.11	0.04													
2. Income growth	1.11	0.05	70												
3. Sales volatility	1.02	0.01	−03	14											
4. Income volatility	1.04	0.02	−01	12	81*										
5. Complexity	0.94	0.07	−34*	−33*	−08	−19*									
Organization															
6. Diversification	6.11	7.67	−04	−07	−24*	−43*	00								
7. Sales[b]	2,715.53	4,221.56	23*	32*	09	09	07	−20							
8. Assets[b]	2,095.66	3,141.26	26*	30*	02	−03	09	−03	76*						
9. Divisionalization	3.44	1.05	07	02	−08	−22*	−04	53*	−09	10					
Performance															
10. ROE	8.76	8.11	16	01	−47*	−53*	−08	30*	−13	−01	22*				
11. ROI	10.11	9.34	19*	05	−36	−43*	−12	27	−14	−02	21*	83*			
12. ROA	9.19	10.53	12	−01	−40*	−45*	−10	28*	−11	−01	19*	85*	83*		
13. Capital market	0.18	0.16	−14	−06	27*	21*	−01	16	−14	−33*	16	−23	−24	−20	
14. Market return	0.09	0.11	−03	00	23*	12	−09	17	−07	−20*	11	−14	−14	−15	71*

[a] Decimal points for correlation coefficients omitted.

[b] In millions.

*$p < .05$

TABLE 2
Standardized Structural Parameter Estimates, Initial Solution

Overall fit assessment:
$\chi^2_{62} = 111.92$, $p < .001$, adjusted fit index = .80, root-mean-square residual = .13

Effects of			
Environmental munificence on:		Firm size on:	
Diversification	= −.15	Diversification	= .00
Size	= .43[a]	Divisionalization	= .07
Operating performance	= −.08	Firm divisionalization on:	
Market performance	= .07	Diversification	= .50[a]
Environmental instability on:		Operating performance	= .09
Diversification	= −.32[a]	Market performance	= .12
Environmental complexity on:		Firm operating performance on:	
Divisionalization	= −.93[a]		
Firm diversification on:		Market performance	= −.35[a]
Size	= −.20		
Operating performance	= .24[a]		
Market performance	= .20		

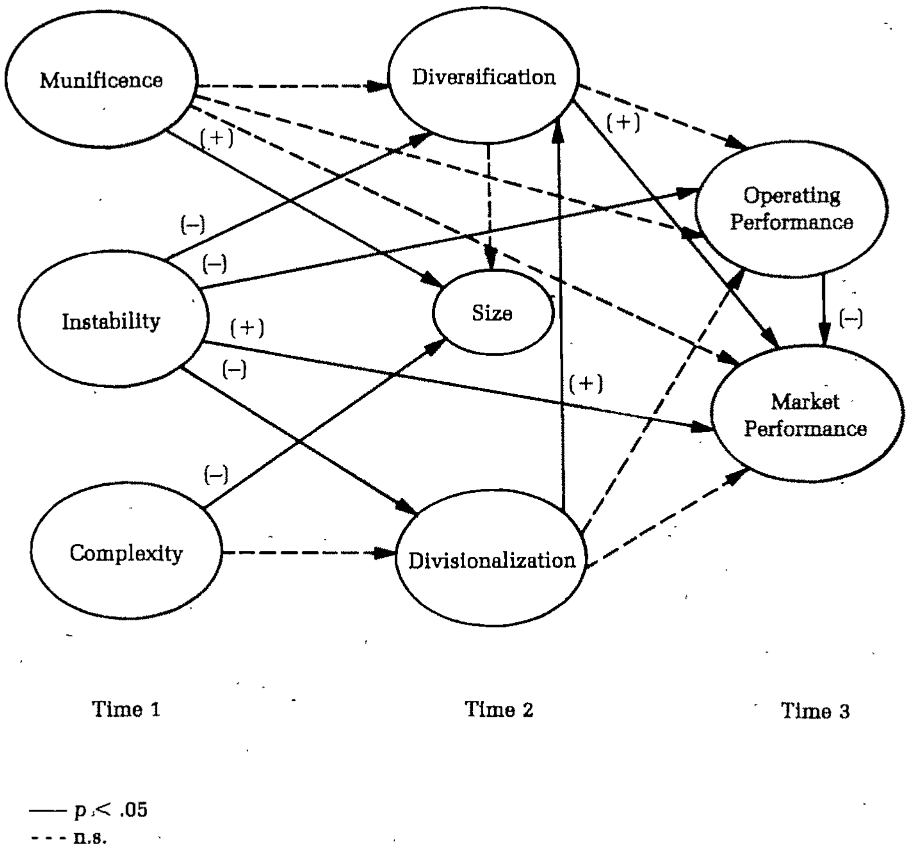
[a] The parameter estimate was at least twice the standard error in the unstandardized solution.

Both Figure 2 and Table 3 summarize the revised model that resulted from the modification process. Figure 2 represents the structural relationships among the theoretical constructs, although for the sake of visual clarity, we omitted the parameter estimates from the figure. Table 3 shows the values of both those structural parameters and of the measurement parameters. The measurement parameters may be interpreted as factor loadings. The evidence indicates that, among those constructs having multiple indicators, all indicators exhibited significant loadings.

The overall assessments of fit of the modified model suggest an adequate fit of model to data ($\chi^2_{58} = 47.45$, $p > .84$; adjusted fit index = .89; root-mean-square residual = .06). Solid arrows on the figure and values footnoted "a" in the table indicate statistically significant parameters. The remaining relationships (dotted arrows on the figure) approached, but did not achieve, statistical significance, had fairly strong support in prior literature, or both. The post hoc model modification process did not constitute hypothesis testing per se, but reflected the best fit of a model to this data set. Thus, we elected to leave those paths in the model. Our reasoning was based on the desire to stimulate future research and hypothesis testing related to the strength and stability of these relationships on other data sets.

One important finding of this study was the pervasive influence of environmental instability. It exhibited significant effects on diversification, divisionalization, and both performance dimensions. Furthermore, three of those four relationships were negative, with market performance the exception. The negative relationships involving divisionalization and diversification in particular are somewhat inconsistent with prescriptive organization theory. Additionally, neither munificence nor complexity exhibited a

FIGURE 2
Solution of Reformulated Model



significant relationship with diversification, divisionalization, or either performance dimension. However, both munificence and complexity exhibited statistically significant relationships with organization size, suggesting that munificent environments with low complexity support growth.

Relationships among the endogenous constructs indicated a causal flow from divisionalization to diversification. Size did not exhibit the mediating role suggested by Grinyer and Yasai-Ardekani (1981). However, we specified the model to examine the environmental effects on, and performance outcomes of, each rather than a time-ordered relationship between them.

Diversification strategy exhibited a significant relationship with only one of the two performance dimensions, market performance. Those findings raise some interesting issues, given the inconclusive pattern of results exhibited by prior research on diversification and performance. Although, in

TABLE 3
Standardized Parameter Estimates, Revised Model

Overall fit assessment:

$\chi^2_{58} = 47.45$, $p > .84$, adjusted fit index = .89, root-mean-square residual = .06

Effects of		Measures of	
Environmental munificence on:		Environmental munificence:	
Diversification	$-.07$	Industry sales growth	$.82^{b}$
Size	$.53^{a}$	Industry income growth	$.85^{a}$
Operating performance	$.15$	Environmental instability:	
Market performance	$-.13$	Industry sales volatility	$.76^{b}$
Environmental instability on:		Industry income volatility	1.06^{a}
Diversification	$-.42^{a}$	Environmental complexity	1.00^{b}
Divisionalization	$-.32^{a}$	Firm diversification	1.00^{b}
Operating performance	$-.52^{a}$	Firm size:	
Market performance	$.27^{a}$	Firm sales volume	$.99^{b}$
Environmental complexity on:		Firm net assets	$.75^{a}$
Size	$-.26^{a}$	Firm divisionalization	1.00^{a}
Divisionalization	$.09$	Firm operating performance:	
Firm diversification on:		ROE	$.93^{b}$
Size	$-.15$	ROI	$.90^{a}$
Operating performance	$.09$	ROA	$.92^{a}$
Market performance	$.23^{a}$	Firm market performance:	
Firm divisionalization on:		Market return	$.98^{b}$
Diversification	$.46^{a}$	Capital market performance	$.68^{a}$
Operating performance	$.07$		
Market performance	$.14$		
Firm operating performance on:			
Market performance	$-.26^{a}$		

[a] The parameter was at least twice the standard error in the unstandardized solution.
[b] Indicates a fixed or single indicator.

the initial solution of the model, diversification did exhibit a statistically significant bivariate relationship with operating performance, the effects of environmental instability accounted for most of this relationship in the revised model. That was not the case with diversification's relationship with market performance, which was significant and positive. We conducted moderated regression analyses of all relationships between environment and organization variables, with each performance dimension as moderator. Only two relationships exhibited significant moderating effects. Market performance moderated both the instability-divisionalization and instability-diversification relationships. In both cases, subgroup analysis revealed correlation coefficients that were significantly different from one another ($p < .05$). However, in both cases, the coefficient for the high-performing group was not significantly different from zero. The extreme negative coefficients for the low-performing groups ($p < .01$) reflected the substance of the relationships. These results further support the findings reported above.[3] For whatever reasons, investors negatively evaluated organizations that responded to high instability by reducing diversification, divisionalization, or both.

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[3] We are indebted to an anonymous reviewer for suggesting this additional analysis. Detailed descriptions of the supplemental analysis as well as the results of the proceduces for the fully nested models may be obtained from the first author.

DISCUSSION

Results supported only a few of the relationships depicted in the original model. The reformulated model suggests dynamics different from those predicted by past theory and research. However, past research primarily used cross-sectional designs, focused on bivariate relationships, and examined only parts of a model. Miller and Friesen (1984) and Van de Ven and Drazin (1985) argued that accurate pictures of organizations' behavior depend on the simultaneous examination of internal and external contingencies and performance criteria of the kind done in the present study. The following sections present the relationships suggested by the reformulated model in terms of the three models proposed by Romanelli and Tushman.

External Control

The external control model received relatively strong support. Each of the three environmental dimensions was found to affect at least one organizational variable. Clearly, however, instability was the dominant influence. The results show that firms in this study that had unstable, and thus uncertain, environments reacted by divesting businesses and developing a simpler structure. Those actions would suggest that the decision focus among the firms was on the reduction of uncertainty by retreating to a better-understood environment and creating a simpler organization rather than on risk reduction through increasing diversification. Low diversity, or high relatedness among organizational units, and low divisionalization make an organization easier to manage. Corporate executives can better understand markets of related products, so uncertainty diminishes. Low divisionalization creates a relatively simple, predictable structure. Thus, reduction of uncertainty may take precedence over risk reduction. However, Bourgeois (1985) warned that firms in volatile environments should not necessarily seek reduced uncertainty because attempts to avoid risk through reducing uncertainty may result in missed opportunities. Strategists, then, must balance risk and return. Increased risk is acceptable if there is a corresponding increase in the probability of a high return (Bowman, 1982). The relationship between instability and market-based performance reflects that fact.

The primary influence of both environmental munificence and complexity was on the size of firms. Munificent environments present opportunities for expansion in existing and new markets and promote slack resources that can support growth, even in inefficient firms. Somewhat surprisingly, munificence did not seem to be a dominant influence on diversification strategy or performance. However, more research is required to determine the influence of munificence on other types of strategic choices or other performance dimensions.

Complex environments may place constraints on firm growth. According to Lawrence and Lorsch (1969), complex environments require high internal differentiation. Therefore, firms must use resources to train, hire, and develop specialists to manage interdependencies in their environment. Thus, they have fewer resources to invest in assets or external market promotion designed to increase product sales and market share. Conversely, low levels of complexity free resources that might otherwise be required to cope with information-processing needs and allow firms to apply those resources to growth. In summary, the external control model received strong support, with primary emphasis on environmental instability.

Strategic Management

Some support for the strategic management model emerged as well. The results suggest that firms respond to an unstable environment through decreasing diversification, thereby decreasing uncertainty. Lower diversification implies higher relatedness among divisions. This finding supports the previously reported trend away from unrelated diversification and toward related diversification (Luffman & Reed, 1982) and Peters and Waterman's (1982) assertion that "excellent" firms during the 1960s and 1970s "stuck to the knitting" (maintained related businesses). Although the notion that related diversifiers outperformed others (cf. Rumelt, 1974) was popular during the 1970s, the empirical support has been mixed (Bettis & Hall, 1982; Varadarajan & Ramanujam, 1987). In this study, the performance relationships suggest that attempts to enact a more certain environment through decreasing diversification might result in lower market performance.

The combination of a direct, positive diversification-market performance link and a direct, positive instability-market performance link raises some interesting questions regarding the strategic management model. Those relationships suggest first that investors may view diversification as a valuable means of balancing risk and return, supporting the findings of Dubofsky and Varadarajan (1987). They further suggest that unstable environments promote that assessment. If executives reverse diversification moves in response to an unstable environment, their attempts to create a more certain environment and manageable organization may lower the market's assessment of the firm. The present results suggest a possible need for refinement of the strategic management model. Decisions still appear to reflect the exercise of strategic choice in the form of domain selection, but the choice appears to be environmentally driven.

Diversification strategy exhibited no significant effects on operating performance. Rather, the results of the nested-models procedure suggest that environment accounted for most of this relationship. The negative relationship between environmental instability and operating performance suggests that, among the firms studied, actions taken to produce a more stable task environment contributed to operating performance. Thus, executives face an interesting potential paradox. One action, increased diversification, may raise market-based performance, but decreasing diversification can indirectly improve operating performance.

Given that many executive compensation systems continue to depend almost exclusively on consideration of operating-performance variables, these paradoxical conditions relate directly to issues raised by agency theory (Barnea, Haugen, & Senbet, 1981; Jensen & Meckling, 1976). Agency theory suggests that the separation of ownership and decision making produces a situation in which managerial decisions may reflect managerial self-interest and result in suboptimal resource allocations (Barnea et al., 1981). To serve their need for control or personal goals, then, decision makers may ignore the performance measures and time frame most relevant to other important constituents. In other words, in the absence of incentives or some form of control, executives may seek to enhance short-term operating performance at the expense of long-term market-based performance.

Inertia

The results provide some support for the inertial model with regard to structure but not with regard to size. We found size to be primarily a dependent variable with no direct independent or mediating effects on the variables examined in this study. Those findings are not wholly inconsistent with the findings of previous research, however. Beyer and Trice (1979) found that the effects of size on horizontal differentiation were indirect. In their research, size exhibited stronger effects on specialization than on horizontal differentiation. Although divisionalization probably reflects dimensions of both differentiation and specialization to some degree, it may more accurately reflect differentiation. Use of the multidivisional structure does not necessarily produce specialization. For example, it does not produce economies of scale. However, operating autonomy allows each of a firm's divisions to focus on its products and markets in terms of time frames, resource allocations, and so forth, and thus does produce differentiation. In general, then, these results show more support for the work of Beyer and Trice than for that of Blau and others. Construct measurements differed between this study and theirs, so care must be taken in comparing the results. However, our results do support Beard and Dess (1981), Bettis (1981), and Christensen and Montgomery (1981), all of whom suggested that size is not an important predictor of performance.

Structure affected strategy, in contrast to Chandler's (1962) thesis that structure follows strategy. He argued that firms develop divisionalized structures to implement diversification effectively. However, the results of this study do not support that linkage. Rather, they support the contention of the inertial model that structure affects strategic choice, and Pitts's (1980) arguments that in highly divisionalized firms, the kind of information gathered and perceptions of opportunities, threats, and the like vary among the separate divisions more than they do in centralized firms. With such characteristics, divisionalized firms provide an environment conductive to diversification. Thus, an organization's structure may influence the strategic decision-making process (Fredrickson, 1986). Since data on strategy and structure were not time-ordered and were cross-sectional in this study, care must be taken in generalizing these results until further longitudinal research tests this relationship.

As Betton and Dess (1985) noted, structural inertia may constrain adaptation to an environment. Hannan and Freeman (1984) suggested that once employees acquire organization-specific skills, they are likely to oppose change that might require development of new skills. The present results offer some support for those conclusions. Although early theorists argued that firms' structures should become more complex in the face of volatile environments (Lawrence & Lorsch, 1969; Thompson, 1967), the results of this study suggest that firms develop simpler, more centralized structures when facing unstable environments. However, the differences between this study and earlier work might relate to differences in construct definition and measurement.

To gain greater control, firms may increase centralized authority, decrease divisionalization, and reduce diversification by divesting unrelated businesses, thus creating more certainty. Our results support Bourgeois's (1985) conclusion that executives attempt to impose simplicity in its absence and Staw and associates' (1981) conclusion that environmental threats may result in increased executive demands for the control needed to cope with the threats. Bourgeois, McAllister, and Mitchell (1978) found that volatile environments produced stress-related responses and a need for an increased sense of control among decision makers, and Miles and Cameron (1982) noted that strategists may choose less than maximally efficient structures to satisfy their own needs or those of critical internal constituencies. Again, these findings are consistent with the issues raised by agency theory.

Performance Relationships

The negative relationship between operating performance and market-based performance was an important finding. One might expect that high operating performance would enhance investors' perceptions of a firm. However, the stock market anticipates positive and negative major events and thus reacts to them before their actual occurrence. When positive events occur (that is, reach their peak), investors may actually anticipate a downturn. When performance declines to low points, investors may anticipate an upturn and react accordingly. Additionally, dynamic environments have negative effects on operating performance but positive effects on market-based performance. Dynamic environments make efficiency difficult to achieve yet present market opportunities for investors. Collectively, those factors may contribute to the observed negative relationship.

Strategic management studies often employ at least one measure of operating performance as a dependent variable. However, the results of this study show the importance of both market-based performance measures—supporting Lubatkin and Shrieves's (1986) argument—and operating-performance measures, given the paradoxical relationships the two types of measures exhibited with the environmental and organizational variables. These results further support Cameron's (1986) view that effectiveness (1) is a multidimensional construct, (2) relates to many domains of activity, and (3) reflects multiple constituencies' desires.

CONCLUSIONS

The results of this study suggest that portions of all three models described by Romanelli and Tushman (1986)—the external control, strategic management, and inertial models—have relevance for organizational functioning. However, the external control model received strongest support. Further, the results suggest that much past research may have oversimplified reality. For example, firms whose goals include improving market-based performance may do so through increasing diversification or through searching for more volatile markets. Apparently, investors view diversification as a means of balancing risk and return favorably and may view volatile environments as providing opportunities. But those environments often increase risk as well. Our findings suggest that executives and investors may view such environments differently. If executives wish to raise market-based performance, perhaps they should consider diversification when facing an unstable environment, despite the possible result of decreasing operating performance. This suggestion is consistent with the emerging interest in basing executive compensation on market performance rather than on operating performance (Kerr & Bettis, 1987).

Although the results reported here clearly do not support size as a structural imperative and are therefore somewhat inconsistent with past literature, there are several plausible, and possibly critical, explanations. First, most past research examining size and structure has focused on bivariate relationships rather than on a complex model of simultaneous relationships, as did this study. Perhaps Cullen, Anderson, and Baker (1986) offered the best explanation. They suggested that as organizations grow larger, the effects of size on other variables decline. Above some size threshold, then, change may have little effect. Given that this data set was composed of *Fortune* 500 firms, size may have had a negligible effect. Future research may identify a size threshold, variables affecting it, and the effects of size below it.

In general, the results suggest that previously researched models involving corporate strategy, size, and structure may not adequately represent the complex interrelationships among those variables. That likelihood could account for the disenchantment expressed by practitioners with simplistic models like portfolio approaches (Kiechel, 1982). Thus, future studies should examine more complex models of organizational functioning using methodologies such as the causal modeling process described in this study or archetype construction, as described by Miller and Friesen (1978, 1984).

This study should be viewed as a stage in the theory-building process. As Bourgeois (1985) noted, the strategy literature lacks theoretical grounding when compared to the organization theory literature. However, both streams of research need to capture complex systems of interacting variables. In the interest of external validity, the revised model developed in this study should be tested on other data sets, including firms of varying sizes and types. The use of time-ordered, objective measures allows more accurate examination of causal effects than use of other types of measures. We recommend they be employed in future model-building efforts (to the extent possible for the firms studied) in the search for more accurate middle-range theories.

Finally, as with much research of this nature, consideration must be given to historical context (Cook & Campbell, 1979). Our results might be different in a different time period, as the prevailing zeitgeist is likely to exert some influence on the structure of the relationships. Thus, future research should assess the model in the context of another time frame. For example, if a model for the decade 1979–89 were constructed, it might reflect the effects of the wave of mergers and the industry consolidation that has characterized this period. It might also reflect the possibility that the assessments underlying market-related performance are partially subjective and can change over time. Comparison of such future models to the present model might reveal important differences in implications for managers.

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APPENDIX

Indicators for Environmental Dimensions

Munificence. The indicators for this dimension were five-year average growth in net sales and growth in operating income in the dominant industry. Using annual figures across all firms in each relevant industry, we treated the natural logarithms (a linear transformation) of each in a time series approach. Time served as the independent variable; McCleary and Hay (1980: 31–34) has an expanded discussion. The decision to use five data points was based on two concerns: the length of the typical planning horizon and availability of meaningful data. The growth measure of each was the antilog of the regression slope coefficient. The result is a smoothed measure of the average growth rate over the period. The basic equation for these indicators is given by

$$y_t = b_0 + b_1 t + a_t,$$

where

y = industry sales or industry operating income,
t = year, and
a = residual.

Instability. The indicators for this dimension reflected five-year patterns of instability in the dominant industry. The measures were the antilogs of the standard error of each regression slope coefficient from the growth equations described above. Thus, to be consistent with the arguments of Dess and Beard (1984) and Tosi, Aldag, and Storey (1973), the indicators capture true discontinuities in the task environment and allow similar scores for task environments that present similar patterns but at different base levels of magnitude.

Complexity. As noted in the text, this measure was based on Grossack's (1965) index of dynamic concentration. It may be thought of as an index of a trend toward or away from dominance by large firms in a task environment over the five-year period of interest. It is essentially a regression of terminal-year market shares of all firms in a given industry (Y_i' s) upon their shares in the initial year (X_i' s). The resulting regression coefficient suggests increasing or decreasing monopoly power in the industry. Erosion may be due to the growth of smaller firms, the entrance of new firms, or some combination of such factors. The regression coefficient may be obtained by $b = \Sigma x_i y_i / \Sigma x_i^2$, where x_i and y_i are the deviations in firm market share from the mean.

Analytical Method

The general LISREL model is given by three equations.

Structural equations model: $\eta = \beta\eta + \Gamma\xi + \zeta$
Measurement model for y: $y = \Lambda_y + \varepsilon$
Measurement model for x: $x = \Lambda_x + \delta$

where

η and ξ are vectors of latent variables,
β and Γ are causal effect coefficient matrices,
x and y are vectors of measured variables, and
Λ_x and Λ_y are matrices of factor loadings.

Fit Assessment

The full-information maximum likelihood procedure provides an overall chi-square goodness-of-fit test of whether a hypothesized model fits the data. The procedure generates a matrix that varies as a chi-square distribution. The probability (p) for the chi-square test refers to the probability of obtaining a chi-square value larger than that actually obtained, given that the hypothesized model holds. Hence, the higher the value of p, the better the fit. It has been suggested that adequate fits may be obtained when the value of p exceeds 0.10.

The adjusted goodness-of-fit index is a measure of the relative amounts of variances and covariances jointly accounted for by the model; unlike the chi-square test, it is independent of sample size and relatively robust over nonnormality. Its values range between 0 and 1, with higher values indicating better fit.

The root-mean-square residual is a measure of residual variances and covariances; it may be used to compare the fit of two different models for the same data. It is interpreted in relation to the sizes of the observed variances and covariances (i.e., those obtained from the data). In this case, lower values indicate better fit.

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IMPACT OF EXCHANGE VARIABLES ON EXIT, VOICE, LOYALTY, AND NEGLECT: AN INTEGRATIVE MODEL OF RESPONSES TO DECLINING JOB SATISFACTION

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This research offers a new theory predicting the effects of three exchange variables, job satisfaction, investment size, and quality of alternatives, on four general responses to dissatisfaction—exit, voice, loyalty, and neglect. Three studies designed to test model predictions received good support. High satisfaction and investment encouraged voice and loyalty and discouraged exit and neglect. Satisfaction and investment interacted, with variations in investment most strongly promoting voice given high satisfaction. Better alternatives encouraged exit and voice and discouraged loyalty. However, there was no link between alternatives and neglect.

One of the most important themes in the history of research on organizational behavior has been the study of employees' responses to job dissatisfaction. Concern with responses to decline in satisfaction is not misplaced. No organization can guarantee uniformly high satisfaction, and understanding the ways in which workers react to lapses in job satisfaction is central to understanding overall organizational effectiveness—job satisfaction-dissatisfaction is a critical variable linked with absenteeism, turnover, and employee dissent (Staw, 1984). Traditionally, researchers working in this domain have explored the effects of predictors such as pay or seniority on such employee responses to dissatisfaction as absenteeism, quitting, or grievance

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filing. Although that approach to the study of the consequences of declining satisfaction has been a fruitful one, shortcomings of the resulting literature are apparent.

One criticism is that investigators have not defined the dependent variables in sufficiently broad terms (Staw, 1984); as Rosse and Hulin stated, researchers tend to examine "surface variables" (1985: 325) rather than behavioral patterns or syndromes representing broader theoretical constructs. For example, it is only recently that researchers have come to view job turnover and job transfer as specific examples of a more general theoretical construct (Jackofsky & Peters, 1983). A second, related problem is the use of specific, atheoretical predictors of employee behavior (Steers & Rhodes, 1978). The use of existing organizational characteristics and policies (e.g., retirement policies, seniority) as correlates of absence behavior illustrates this relatively concrete, atheoretical approach. Research in related fields has obtained strong predictive power by using independent and dependent variables of the same conceptual level, variables that represent abstract, unobserved constructs or response classes. An example is the use of attributional processes to explain leader emergence (Calder, 1977).

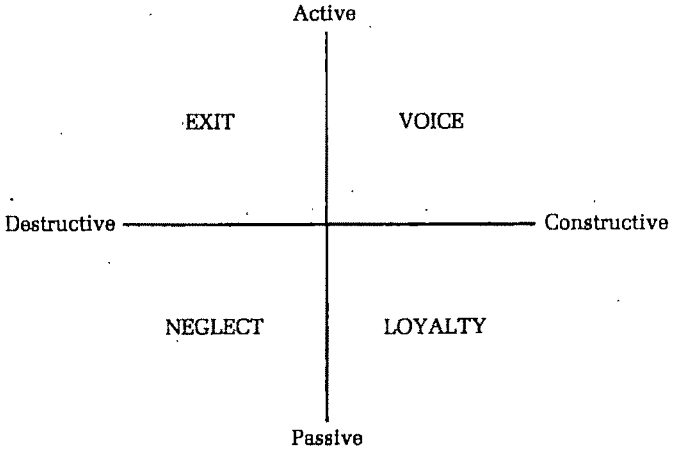
This is not to say that there are no models of response to dissatisfaction that embody a more integrative strategy. One approach to the study of responses to decline in satisfaction, often called progression theory, suggests that responses to dissatisfaction differ in intensity and that employees progress from less to more intense responses as dissatisfaction persists or intensifies (e.g., Blau, 1985; Ferris, 1985; Sheridan, 1985; Youngblood, 1984). For example, an employee might initially react to dissatisfaction with increased absence and later respond by quitting the job. Empirical tests of relationships among withdrawal behaviors have revealed significant but weak and inconsistent support for asserted relationships (Clegg, 1983; Wolpin & Burke, 1985). A second approach has emphasized the role of performance in predicting turnover and other responses to job dissatisfaction and frustration (Jackofsky, 1984; Keller, 1984; O'Connor, Peters, Pooyan, Weekley, Frank, & Erenkrantz, 1984; Wells & Muchinsky, 1985). A common assumption in such models is that, given high perceived desirability of movement or low intrinsic rewards, superior performance is associated with high perceived ease of moving to another job (March & Simon, 1958), and thus a positive relationship between performance and turnover is predicted. However, recent studies have revealed contradictory findings regarding this issue; some research has found positive associations between performance and turnover (Wells & Muchinsky, 1985), and some has revealed negative associations (Keller, 1984; O'Connor et al., 1984). Researchers taking a third approach have proposed that absence and turnover are differentially probable as a function of length of organizational service (Hill & Trist, 1955; Rosse & Hulin, 1985; Rosse & Miller, 1984). Recent work in this tradition has benefited from cognitive psychology, For example, Mowday, Porter, and Steers (1982) developed a broad cognitive model of employee turnover, including residual categories such as efforts to change a situation and "alternative modes of accommodation" (1982: 124). Though scholars taking the third approach have proposed some theories that move beyond simple unidimensional explanations and some that explore multiple responses, most of the models are fairly concrete, somewhat atheoretical, or lacking a broad set of known responses to dissatisfaction such as error rates (Petty & Bruning, 1980), transfers (Todor & Dalton, 1982), and grievance filing (Allen & Keaveny, 1985; Dalton & Todor, 1982).

This research outlined and tested a new theory intended to serve as an integrative model of responses to job dissatisfaction. The theory includes multiple predictor variables and a comprehensive typology of the range of available responses and aims at a broad, abstract level of explanation. The typology is based on Hirschman's (1970) discussion of responses to organizational decline and on Rusbult's model of responses to dissatisfaction in close relationships (Rusbult, Zembrodt, & Gunn, 1982). The typology includes four response categories: *Exit* refers to leaving an organization by quitting, transferring, searching for a different job, or thinking about quitting. *Voice* describes actively and constructively trying to improve conditions through discussing problems with a supervisor or co-workers, taking action to solve problems, suggesting solutions, seeking help from an outside agency like a union, or whistle-blowing. *Loyalty* means passively but optimistically waiting for conditions to improve—giving public and private support to the organization, waiting and hoping for improvement, or practicing good citizenship. *Neglect* refers to passively allowing conditions to deteriorate through reduced interest or effort, chronic lateness or absences, using company time for personal business, or increased error rate.

The four categories relate to one another in a systematic fashion, as demonstrated in Farrell's (1983) multidimensional scaling study. Exit, voice,

FIGURE 1

Exit, Voice, Loyalty, and Neglect Typology of Responses to Job Dissatisfaction



loyalty, and neglect differ along dimensions of constructiveness versus destructiveness and activity versus passivity (see Figure 1). Voice and loyalty are constructive responses in which an individual attempts to revive or maintain satisfactory employment conditions, whereas exit and neglect are more destructive. We defined the dimension of constructiveness-destructiveness in terms of impact on employee-organization relationships and immediate sources of dissatisfaction, not in terms of its broader functional value. For example, a worker's exit might be constructive for that employee or for his or her organization but destructive in that it dissolves the employee-organization link. On the second dimension, exit and voice are active mechanisms through which employees attempt to deal with dissatisfaction (Spencer, 1986), whereas loyalty and neglect are more passive and diffuse; Milburn, Schuler, and Watman suggested this contrast, stating "the individual will decide to be either passive or active vis-à-vis the antecedents of the crisis" (1983: 1165). "Passive" refers to the impact of an action on a problem and not to the character of a response itself. For example, a neglectful response, such as chronic absenteeism, involves overt action, though it is passive and destructive in regard to work problems. Finally, it should be noted that the category names are labels for a broad range of related responses. Voice includes not just vocalizing to discover solutions but also taking unilateral action to solve problems. Neglect includes very passive responses such as reduced interest as well as responses that are only moderately passive (e.g., intentionally missing work). Prior research using this typology has demonstrated that the four responses relate empirically in accordance to the hypothesized structure: behaviors within categories relate more strongly to one another than to responses in adjacent or opposing categories, and measures of each response possess both convergent and discriminant validity (Farrell, 1983; Rusbult & Lowery, 1985).[1]

THE IMPACT OF EXCHANGE VARIABLES ON EXIT, VOICE, LOYALTY, AND NEGLECT

Under what circumstances are employees likely to engage in each category of response? The proposed theory extended traditional exchange theory constructs (Blau, 1964; Homans, 1961), particularly interdependence theory (Kelley & Thibaut, 1978; Thibaut & Kelley, 1959).[2] Previous studies have used the critical predictors in the model to account for employee turnover (Farrell & Rusbult, 1981; Rusbult & Farrell, 1983). We suggest that three primary variables should affect the likelihood that an employee will engage in each response—level of overall job satisfaction, or satisfaction prior to a problem; magnitude of investment in a job; and quality of job alternatives. We have defined the three predictors broadly and abstractly, and thus they match the conceptual level of the exit, voice, loyalty, and neglect model.

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[1] Indeed, factor analysis of items from an instrument designed to measure exit, voice, loyalty, and neglect responses—an instrument similar to those used in the present studies—revealed excellent evidence for the proposed structure. The analysis revealed two primary factors, one with positive loadings for loyalty items and negative loadings for exit items and a second with positive loadings for voice items and negative loadings for neglect items (Farrell & Rusbult, 1986).

[2] The assumptions underlying the model mirror those of interdependence theory. We assumed that employees react in a sensible and reasonable manner to work situations, given their dispositions and perceptions of situational contingencies. In reacting to a given situation, individuals consider both immediate and long-term consequences for themselves and for others with whom they are interdependent. Such responses are often based on deliberate, thoughtful decisions, though habitual response tendencies may develop in reaction to familiar situations.

First, in comparison to employees who were satisfied with a job before the emergence of problems, employees with lower prior satisfaction should be more likely to engage in destructive responses and less likely to engage in constructive responses. As has been well documented elsewhere, the components of job satisfaction include feelings regarding supervision, pay, and co-worker relations (Hulin & Smith, 1965; Locke, 1969). To the degree that overall satisfaction is great, employees should evidence a strong tendency to respond to specific work problems with voice or loyalty and should display a weak tendency to react with exit or neglect.[3] Employees who have been generally satisfied with their jobs should feel strongly motivated to restore good working conditions and may also feel optimistic about the possibilities for improvement. Although previous research has not directly examined level of prior satisfaction, there is some good indirect support for these assertions: Low job satisfaction has been shown to be associated with strong tendencies toward exit behaviors such as quitting (Cotton & Tuttle, 1986; Dalessio, Silverman, & Schuck, 1986; Steel & Ovalle, 1984), transferring (Campion & Mitchell, 1986; Todor, 1980), and intending to quit (Hom, Griffeth, & Sellaro, 1984; Mowday, Koberg, & McArthur, 1984) and has also been associated with tendencies toward neglectful behaviors such as lateness (Adler & Golan, 1981; Farrell & Robb, 1980), increased error rate (Petty & Bruning, 1980), and absence (Gaudet, 1963; Muchinsky, 1977). High job satisfaction appears to promote voice behaviors such as grievance filing (Allen & Keaveny, 1985; Dalton & Todor, 1982; Price, Dewire, Nowack, Schenkel, & Ronan, 1976) and making job suggestions (VanZelst & Kerr, 1953) and acts of loyalty such as good citizenship behavior (Bateman & Organ, 1983; Smith, Organ, & Near, 1983) and job commitment (Aranya, Kushnir, & Valency, 1986; Ferris & Aranya, 1983). Thus,

> *Hypothesis 1: Employees with high levels of overall job satisfaction and high prior satisfaction should be more likely to engage in voice and loyalty and less likely to*

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[3] It is useful to think of prior satisfaction, or overall satisfaction, as the ground against which the figure of a current dissatisfying incident is evaluated. In the final analysis, it is probably the relationship between level of overall satisfaction and level of current dissatisfaction that directly influences response mode. Thus, a more precise definition of current dissatisfaction and a more precise prediction of response tendencies may ultimately result from a mathematical combination of information about variables such as prior/general satisfaction, probability of future satisfaction, severity of a specific work problem, and importance of a specific work problem.

> *engage in exit and neglect than employees with low overall job satisfaction.*

Second, the constructiveness of employees' responses to dissatisfaction should be positively related to their investment in their jobs. By investment, we mean resources an employee has put into a job that have become intrinsic to that position, such as years on the job, nonportable training, familiarity with the organization and supervisor, and nonvested retirement funds, and resources that were originally extraneous but have become connected to the job, such as convenient housing and travel arrangements and friends at work (Becker, 1960; Ritzer & Trice, 1969; Rubin & Brockner, 1975). Employees who have great investment in their jobs have much to lose by abandoning them and should be more likely to engage in voice or loyalty than those with low investment. With low investment, an employee has little to lose if the job were to end, so exit and neglect responses should become more probable. Indeed, previous research has linked voice behaviors such as making job suggestions and grievance filing with investments such as seniority (VanZelst & Kerr, 1953) and prior promotions (Price et al., 1976). Psychological and material investment has been shown to promote loyalty responses such as commitment, positive work attitudes, and good citizenship behavior (Arkes & Blumer, 1985; Buchanan, 1974; Meyer & Allen, 1984). Quitting and intent to quit appear to be inhibited by relatively greater length of service (Ferris & Aranya, 1983; Rusbult & Farrell, 1983; Werbel & Gould, 1984; Youngblood, Mobley, & Meglino, 1983), identification with a job (Koch & Steers, 1978), and training (Guzzo, Jette, & Katzell, 1985; Wanous, Stumpf, & Bedrosian, 1979). Similarly, previous research has shown neglectful behaviors like absence, lateness, and lack of effort to be inversely related to investments such as cross-training, work-connected recreational programs, and home ownership (Pascale, 1978; Watson, 1981). Thus,

> *Hypothesis 2: Employees with high investment in a job should be more likely to engage in voice and loyalty and less likely to engage in exit and neglect than employees with low investment.*

Third, to the degree that employees have high-quality alternatives to their current job, they should be likely to engage in active responses. Good alternatives, such as attractive job opportunities, the possibility of early retirement, or the acceptable option of not working, create in an individual the motivation to do something (shape up or ship out) and provide a source of power for bringing about change because the employee has acceptable options if the job declines further or ends. In the absence of good alternatives, the options are to wait quietly for conditions to improve (remain loyal) or to passively allow conditions to worsen (engage in neglect). The findings of research on the effects of alternatives such as employment opportunities, high personal esteem, labor supply, and external support have been consistent with those predictions. Good alternatives promote exit behaviors such as quitting and intent to quit (Dreher & Dougherty, 1980; Farrell & Rusbult, 1981; Mowday et al., 1984; Price & Mueller, 1981; Schneider, 1976; Stumpf & Hartman, 1984) and voice behaviors such as whistle-blowing (Miceli & Near, 1984), grievance filing (Fleishman & Harris, 1962; Muchinsky & Maassarani, 1980), and constructive social movements (Lammers, 1969; Zald & Berger, 1978). Employees with poor alternatives evidence high levels of loyal behaviors like job commitment (McLaughlin & Butler, 1974; Pfeffer & Lawler, 1980) and of neglectful responses like absenteeism and slow-down behaviors (Behrend, 1953; Crowther, 1957; Larson & Fukami, 1985; Owens, 1966; Watson, 1981; Youngblood, 1984). Thus,

> *Hypothesis 3: Employees with high-quality alternatives should be more likely to engage in exit and voice and less likely to engage in loyalty and neglect than employees with poor-quality alternatives.*

TESTS OF THE MODEL

We designed three studies to provide direct empirical tests of this model. Study one, a simulation experiment, provided preliminary information regarding the causal impact of the model's variables on responses to dissatisfaction and allowed for the study of variables, such as intense dissatisfaction, that are difficult to manipulate ethically and powerfully in a laboratory experiment. Study two, a large-scale cross-sectional field survey, extended external validity in two ways. First, it explored the effects of generalized job satisfaction, investment size, and quality of alternatives on generalized tendencies toward exit, voice, loyalty, and neglect. Second, it tested the model's predictions among actual employees. Study three, a laboratory experiment, complemented studies one and two, focusing on the causal impact of model variables in an experimental work setting, by examining temporal changes in response tendencies over an extended period of declining satisfaction and by using additional—and more behavioral—measures of exit, voice, loyalty, and neglect.

The three studies complemented one another to maximize both construct and external validity (Cook & Campbell, 1979). Employing multiple methodologies and multiple measurement methods enhanced construct validity. Exploring response tendencies for multiple populations (simulated and real employees) in multiple settings enhanced external validity.

STUDY ONE

Methods

Subjects. Sixty-four men and 64 women participated to fulfill the research experience requirements for introductory psychology at the University of Kentucky during the 1984–85 academic year. We randomly assigned 8 men and 8 women to each of eight conditions. No data were excluded.

Procedures. Approximately 20 students reported to each laboratory session, where the experimenter (one of the authors) delivered instructions.

Each subject read an essay describing a hypothetical situation in which the protagonist was faced with declining working conditions (see Appendix A). The hypothetical employee's supervisor had begun to give arbitrary and inconsistent instructions, and the employee felt that those instructions were neither appropriate nor helpful.

Level of prior job satisfaction was manipulated through variations in descriptions of the employee's job. Employees worked for a mediocre or for a good company that provided a decent or a high salary for work that was described as moderately or as really enjoyable. Investment size was manipulated through variations in job tenure. Employees had worked for the company for a short or for a long period of time—two months or two years. Quality of alternatives was manipulated through variations in descriptions of an alternative job offer. Employees had offers that were not very or very attractive, with poor or good pay and no challenge or high challenge (see Appendix A). Participants were asked to place themselves mentally in the situation described and to complete a questionnaire indicating how they would react. The questionnaire included two manipulation checks for each independent variable and a 17-item scale that measured tendencies toward each response to dissatisfaction. There were four items each to measure exit, voice, and loyalty and five to measure neglect (see Appendix A).

Results

Reliability of measures. Reliability coefficients were calculated for the measures designed to assess tendencies toward exit, voice, loyalty, and neglect as well as for the manipulation checks for each independent variable. Table 1 presents alphas for each set. The coefficient for the voice items was lower than desired, which suggests that this category may be more heterogeneous than the others.[4] In addition, we assessed the discriminant validity of our measures by calculating the average correlation between the items in each set and those in every other set. For example, the four exit items were correlated with the four voice items, producing a matrix of 16 correlation coefficients, which we averaged. As expected, given the structure of the typology, these correlations were negligible or weak. The average r was .00; the range was from −.24 to .18. The average r for opposing categories was −.17, the average r for adjacent categories was .06, and the average r for items within categories was .42. We judged the items designed to measure each set to be acceptably reliable and distinct from those designed to measure other response categories, so we formed a single averaged measure of each construct.

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[4] That some categories may be more heterogeneous should not be surprising. For example, the strength of the reliability coefficient for the exit category suggests that exit may be a largely homogeneous category of response. It is likely that employees who say that they intend to quit will also say that they have explored alternative jobs and have thought about quitting. In contrast, the coefficient for the voice category is lower. Those who voice by discussing problems with their supervisor will not necessarily engage in other forms of voice. Thus, variability in size of reliability coefficients may reflect real differences in category complexity. Such differences do not undermine the usefulness of the proposed typology. Its usefulness lies in its ability to identify categories wherein responses within a given category bear more conceptual and empirical similarity to one another than to responses in other categories.

Manipulation checks. The manipulation checks were subjected to a three-factor analysis of variance. Subjects in the low-prior-satisfaction condition reported lower satisfaction with their jobs than did those in the high-prior-satisfaction condition ($\bar{x} = 4.31$ and 8.27, respectively; $F_{1,120} = 497.58$, $p < .001$).[5] Low-investment participants reported lower investment size than did their high-investment counterparts ($\bar{x} = 2.55$ and 6.48, respectively; $F_{1,120} = 264.49$, $p < .001$). And participants in the poor-alternatives condition described their alternatives more negatively than did those in the good-alternatives condition ($\bar{x} = 1.86$ and 7.86, respectively; $F_{1,120} = 1{,}455.92$, $p < .001$). We examined interaction terms to assess the stability of our manipulations. No sizable interaction effects were observed: the next largest F value was 7.68, which is small in comparison to those listed above.

Testing model predictions. To test our predictions, a three-factor multivariate analysis of variance was performed on the exit, voice, loyalty, and neglect measures. Table 2 presents both multivariate and univariate Fs for each main effect. Consistent with predictions, the multivariate effect of prior satisfaction was significant, with high satisfaction producing strong tendencies toward voice and loyalty and weak tendencies toward exit and neglect. The multivariate effect of the investment-size manipulation was marginally significant: high investment size produced low levels of exit and high levels of loyalty. The investment manipulation did not significantly affect voice or neglect, however. The multivariate effect of the manipulation of quality of alternatives was significant, with good alternatives encouraging high exit and voice and discouraging loyalty. The quality-of-alternatives manipulation did not significantly affect neglect responses.

TABLE 1
Reliability Coefficients for All Model Variables, Studies One, Two, and Three[a]

	Job Satisfaction	Investment Size	Quality of Alternatives	Exit	Voice	Loyalty	Neglect
Study one	.97	.81	.98	.89	.45	.75	.79
Study two	.84	.62	.78	.76	.57	.56	.69
Study three	.77	.85	.58	.97	.77	.70	.82

[a] Table values are the alphas for the set of items associated with each construct for each study. For study two, the job-satisfaction, investment-size, and quality-of-alternatives measures are the predictor variables; for studies one and three they are the manipulation checks.

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[5] Further analyses of the manipulation-check data revealed that the effects discussed herein were robust, holding not only for the averaged manipulation checks but also for the individual manipulation check items that were combined to form the averaged measure.

TABLE 2
Results of MANOVA, Study One[a]

Variables[b]	Exit	Voice	Loyalty	Neglect	Multivariate F[c]
High job satisfaction	3.15	6.70	5.23	2.64	
Low job satisfaction	4.94	6.25	3.53	3.18	
F	55.58**	3.97*	47.31**	3.83**	22.48**
High investment size	3.80	6.60	4.67	2.81	
Low investment size	4.29	6.36	4.09	3.01	
F	4.17*	1.12	5.65*	0.55	2.27†
High-quality alternatives	5.65	6.75	3.90	2.77	
Low-quality alternatives	2.44	6.21	4.86	3.05	
F	177.46**	5.64*	15.20**	1.04	63.75**

[a] Values are the mean level of each response, each of which had a possible range from 1 to 9.

[b] The F rows list the univariate effect of each independent variable on each dependent variable.

[c] The multivariate F column lists the multivariate effect of each independent variable on the four responses.

†$p < .10$
*$p < .05$
**$p < .01$

To explore the boundaries of the simple additive model presented in the introduction, we also examined interaction terms. There were two significant two-factor interactions. The interaction of satisfaction and investment was significant for the voice measure; high investment encouraged strong voice only under conditions of high satisfaction. The second interaction was an intensification effect. Good alternatives encouraged exit given either low or high satisfaction, but this effect was strongest under conditions of low prior satisfaction.

To assess the generalizability of these findings for men and women, we performed a four-factor multivariate analysis of variance. Only one effect involving gender was significant: gender, prior satisfaction, and investment interacted in affecting voice. Women voiced at high levels given high satisfaction and high investment or low satisfaction and low investment. Men voiced as predicted—high investment encouraged strong voice with either low or high satisfaction.

STUDY TWO

Methods

Respondents. The respondents were employees of a large communications utility company. A randomly selected third of the membership of 11 locals of the representing union ($n = 864$) were mailed questionnaires, cover letters, and stamped return envelopes in the spring of 1983. We mailed two sets of follow-up materials, following Dillman's (1978) methods. The overall response rate was 55 percent, with 473 employees responding, 54 percent of whom were men.[6] The typical respondent was 40.9 years of age, had 12.5 years of schooling, and earned $23,200 per year.

Questionnaire. The questionnaire obtained measures of all model predictors and criteria as well as demographic information. For each independent variable—job satisfaction, investment size, and quality of alternatives—we obtained both concrete and global measures. The concrete measures taught respondents the meaning of the global items (Farrell & Rusbult, 1981; Rusbult & Farrell, 1983). For example, it might be difficult to answer the question, "Are there things uniquely associated with this job that you would lose if you were to leave?" without a few concrete examples of investments that might be lost such as nonvested retirement funds and specific job training. Most of the concrete items had 3-point Likert-type scales, and all the global items had 5-point Likert scales. The exit, voice, loyalty, and neglect items were similar to those employed in study one, altered to measure generalized response tendencies rather than responses to a particular dissatisfying incident and to be appropriate for actual employees (see Appendix B).

Results

Reliability of measures. Table 1 presents reliability coefficients for each variable. As in study one, we assessed the discriminant validity of the items by calculating correlations between items from each set and those from every other set. Again, these correlations were low (average $r = -.01$, range $= -.15$ to .16), with an average correlation of $-.11$ for items in opposing categories and an average of .04 for items in adjacent categories (average r for items within categories $= .33$). Since our measures appeared to be acceptably reliable within categories and discrete across categories, we formed a single averaged measure of each construct.

Validity of independent variables. Both concrete and global measures of the three independent variables were obtained. We used multiple regression analysis to assess the relationship between the several concrete measures of each construct and their global counterparts. We found evidence for the validity of our measures: concrete measures were significantly correlated with global measures for job satisfaction (adjusted $R^2 = .499$), investment size (adjusted $R^2 = .349$), and quality of alternatives (adjusted $R^2 = .490$). Thus, our predictor variables appeared to be valid measures of the constructs they were intended to assess.

Testing model predictions. To assess the effects of all predictors on each response, we performed four multiple regression analyses with simultaneous inclusion of predictors. Table 3 presents means, standard deviations, and zero-order correlations, and Table 4 presents a summary of the results of the multiple regression analyses. Collectively, satisfaction, investment, and alternatives significantly predicted each of the four responses. Higher job satisfaction was associated with higher loyalty and lower exit and neglect. Higher investment size was associated with higher tendencies toward voice and lower tendencies toward exit and neglect. And good alternatives encouraged the exit and voice responses. No other regression coefficients were significant, though the zero-order correlations were significant for the investment-loyalty ($r = .15$) and alternatives-loyalty ($r = -.12$) relationships.

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[6] Thus, our sample resembled national labor force averages in education and proportion of men; members were slightly older and earned slightly higher salaries than the average.

To determine whether the interactions observed in study one emerged in study two, we performed a median split on the satisfaction measure and calculated separate investment-voice correlations for the low- and high-satisfaction groups. Consistent with study one's results, those analyses revealed that the investment-voice relationship was greater for the high-satisfaction group than for the low-satisfaction group, but this difference was not statistically significant ($r = .12$ and $.07$, respectively; $z = 1.11$) (Cohen & Cohen, 1975). Also consistent with study one, the investment-voice correlation was significantly greater for men than for women ($r = .21$ and $-.09$, respectively; $z = 6.57$). In study one we also found that the impact of quality of alternatives on exit was strongest given low job satisfaction. No such intensification effect emerged in study two. Quality of alternatives was as

TABLE 3
Means, Standard Deviations, and Zero-Order Correlations, Study Two

Variables	Means	s.d.	1	2	3	4	5	6
1. Exit	1.93	1.28						
2. Voice	3.56	1.26	.21**					
3. Loyalty	3.31	1.30	−.33**	−.03				
4. Neglect	1.63	0.98	.31**	.01	−.18**			
5. Job satisfaction	3.51	1.43	−.52**	−.09	.34**	−.13**		
6. Investment size	2.34	1.23	−.29**	.08	.15**	−.14**	.29**	
7. Quality of alternatives	3.73	1.12	.36**	.25**	−.12**	.00	−.22**	−.20**

** $p < .01$

TABLE 4
Results of Multiple Regression Analyses, Study Two

	Exit	Voice	Loyalty	Neglect
Job satisfaction[a]	−.432**	−.071	.331**	−.112*
Investment size	−.117**	.164**	.054	−.121*
Quality of alternatives	.228**	.276**	−.041	−.052
Multiple R	.582	.297	.358	.176
Adjusted R^2	.335	.082	.123	.025
Multivariate $F_{3,462}$	79.02**	14.90**	22.71**	4.93**

[a] Values for job satisfaction, investment size, and quality of alternatives are regression coefficients.

*$p < .05$

**$p < .01$

strongly correlated with exit among low-satisfaction respondents as among high-satisfaction respondents (r = .31 and .32, respectively; z = 0.00).

To explore possible gender effects, we calculated correlations among all predictors and criteria separately for the two genders. The only notable difference was for the investment-voice relationship. Consistent with the results of study one, high investment size consistently promoted voice among men but not among women (r = .16 and .00, respectively; z = 3.49).

STUDY THREE

Methods

Subjects. Forty men and 40 women participated to fulfill the research experience requirements for introductory psychology at the University of Kentucky during the 1984–85 academic year. We randomly assigned each of six students recruited for each session to one of eight conditions; ultimately, there were ten subjects per condition. Students received $5.00 for their participation in the two-hour experiment.

Procedures. The study was a simulation of a newspaper newsroom. The experimenter described a variety of available work tasks and discussed the average pay per session for each task. She then allegedly randomly assigned initial tasks to subjects; however, the task—decoding reports written in "reporters' speed writing"—did not actually vary. The experimenter told the subjects that after three work sessions they would have the option of switching to a second task, which was in fact always transcribing telex messages. She also informed them that their supervisor, "an M.B.A. student," was in the next room behind a one-way mirror. Subjects were given ten minutes to read training materials to "prepare them for their work." At the end of the training session the supervisor entered the room, distributed work materials, and left. He returned after five minutes, collected the work, and retired to his office to prepare written evaluations. When he returned, he gave all subjects a written evaluation of their work during the first session and distributed a set of materials for the second session. This procedure was followed for a total of three work sessions.

Independent variable manipulations. Four variables were manipulated: Prior satisfaction was varied by manipulating anticipated pay for the assigned task; on the average, expected pay was $4.30 for the high-satisfaction condition and $2.85 for the low-satisfaction condition. Quality of alternatives was manipulated by varying anticipated pay for the new task available after three work sessions; on the average, expected pay was $4.35 for the good-alternatives condition and $2.90 for the poor-alternatives condition. Investment size was varied through the training subjects received. They received specific work training in how to decode reporters' speed writing in the high-investment condition and received general work training that described a variety of newsroom tasks in the low-investment condition. Over the course of three sessions, the task became increasingly difficult and the supervisor's evaluations became increasingly negative. The evaluation feedback form included five-option evaluations (poor, passing, adequate, good, superior) along seven dimensions of performance (e.g., completeness of work, readability). Over the three sessions, the job became more difficult and the evaluator's feedback declined from an average rating of adequate-to-good in session 1 to an average rating of passing-to-adequate in session 2 to an average rating of passing in session 3. The supervisor's feedback included written comments, which also became more negative: "This was about what I expected for the first work period" for session 1, "I'm not really happy with this one. Work harder!" for session 2, and "This was pretty poor, and the story wasn't that hard. Are you awake!" for session 3.

Manipulation checks and dependent variables. At the end of each work session subjects completed questionnaires that measured self-reported tendencies toward each response and assessed the effectiveness of each manipulation. On the measures of response to job dissatisfaction, subjects were asked to assume that the previous session represented experiences during a one-month period[7] and to report on likelihood of engaging in each response. All measures were 7-point scales (see Appendix C). At the end of session 3, behavioral measures were obtained. Subjects selected one of four memos to send the supervisor. The memos read as follows:

> Exit: I have considered the benefits and drawbacks of my alternative and the task I've been doing. I would like to transfer to my alternative job.
>
> Voice: I'd like to keep working on this task, but you should make some changes. I have some questions and suggestions regarding our feedback and evaluation system. Can I talk to you about my ideas?
>
> Loyalty: All things considered, I believe the best thing for me is to stick with my current task. I would say that a job like this is better than most.
>
> Neglect: I've lost some enthusiasm for my work, but I'll continue with my assigned job. If you looked around you'd probably see that workers here are becoming unhappy and are losing their motivation to work hard.

Results

Reliability of measures. Table 1 presents reliability coefficients for the manipulation checks and response-to-dissatisfaction items. As in studies one and two, we evaluated the discriminant validity of our items by calculating correlations between all items within each set and the items that composed every other set. Those statistics provided good evidence for distinctiveness across sets (average r = .00; range = −.28–.25); the average correlation between items from opposing categories was −.12, and the average correlation between items from adjacent categories was .06 (average r within categories = .50). Since our measures appeared to be acceptably reliable within categories and distinct across categories, we calculated a single averaged measure of each construct.

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[7] Participants were asked to adopt this time perspective so that all available responses to job dissatisfaction would in fact be viable options. For example, it makes sense to speak of tendencies toward increased absenteeism or lateness when speaking of a month on a real job, whereas such responses are not logical possibilities within the context of a two-hour laboratory experiment.

Manipulation checks. Four-factor analyses of variance with three between-subjects factors (satisfaction, investments, alternatives) and one within-subjects factor (session 1, 2, or 3) were performed on the manipulation checks to assess the effectiveness of each experimental manipulation. In comparison to subjects in the low-prior-satisfaction condition, those in the high-prior-satisfaction condition reported significantly greater satisfaction with their assigned task ($\overline{X}$ = 2.54 and 4.68, respectively; $F_{1,209} = 207.28$, $p < .001$). Subjects in the low-investment condition reported that they had significantly less invested in their assigned task than did those in the high-investment condition ($\overline{X}$ = 3.71 and 5.58, respectively; $F_{1,209} = 237.63$, $p < .001$). Subjects in the low-quality-of-alternatives condition viewed their alternative task as less attractive than did those in the high-alternatives condition ($\overline{X}$ = 2.75 and 5.19, respectively; $F_{1,209} = 226.58$, $p < .001$). In addition, over the course of the three work sessions there was a marginally significant decline in satisfaction with working conditions ($\overline{X}$ = 3.84, 4.15, and 4.23, respectively; $F_{1,209} = 2.68$, $p < .071$). Thus, participants appear to have experienced our manipulations as intended; each of the manipulations created the intended conditions.[8]

Testing model predictions: Self-report measures. A four-factor analysis of variance on the self-report measures revealed significant multivariate effects of all four independent variables (see Table 5). Consistent with predictions, high job satisfaction promoted voice and loyalty and inhibited exit. The manipulation of investment size significantly affected only the neglect measure. High-quality alternatives promoted exit and voice but did not significantly affect the passive loyalty or neglect responses. And over time, declining working conditions produced increases in exit, voice, and neglect, and reductions in loyal behavior.

As did studies one and two, study three revealed a significant interaction between job satisfaction and investment size, with high investment promoting voice more strongly under conditions of high satisfaction. No other interactions were statistically significant in the four-factor analyses. A five-factor

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[8] Further analyses of the manipulation-check data revealed that the effects discussed herein were robust, holding not only for the averaged manipulation checks but also for the individual manipulation check items that were combined to form the averaged measure. The effect on the manipulation checks of the independent variable, decline in satisfaction, may have been only marginally significant because this set of items was somewhat more heterogeneous than were the other sets of manipulation check items (see Appendix C). Indeed, the reliability coefficient for this set of items was only .20. However, this independent variable significantly influenced all four measures of response to dissatisfaction, suggesting that the manipulation was probably appropriately powerful.

TABLE 5
Results of MANOVA, Study Three[a]

Variables	Exit	Voice	Loyalty	Neglect	Overall[b]
Self-report measures					
High job satisfaction	2.96	4.10	4.12	2.46	
Low job satisfaction	4.08	3.78	3.83	2.39	
F	19.59**	4.25*	5.68*	0.24	6.26**
High investment size	3.68	3.91	3.91	2.27	
Low investment size	3.41	3.98	4.04	2.58	
F	0.75	0.38	2.05	4.87*	2.35*
High-quality alternatives	4.18	4.08	3.96	2.43	
Low-quality alternatives	2.86	3.81	3.99	2.42	
F	29.85**	3.07**	0.05	0.00	7.54**
Low decline in satisfaction	3.08	3.58	4.35	2.10	
Moderate decline in satisfaction	3.58	3.90	3.95	2.47	
High decline in satisfaction	3.91	4.35	3.62	2.72	
F	4.90**	8.90**	8.59**	6.54**	3.94**
Behavioral measures					
High job satisfaction	9	14	8	9	
Low job satisfaction	15	9	5	11	1.83*
High investment size	11	13	9	7	
Low investment size	13	10	4	13	1.83*
High-quality alternatives	16	11	6	7	
Low-quality alternatives	8	12	7	13	1.62*

[a] For the self-report measures, values are mean levels of each response, ranges 1–7. For the behavioral measures, values are the number of participants who selected each response.

[b] For the self-report measures, the column labeled "overall" lists the multivariate effect of each independent variable; for the behavioral measures, lists z's for the tests of differences in proportions (for the satisfaction and investment rows, the z for the constructiveness-destructiveness contrast; for the alternatives row, the z for the activity-passivity contrast).

*$p < .05$

**$p < .01$

analysis of variance revealed only one significant effect involving gender: the main effect of gender on neglect was significant, with men engaging in higher levels of neglect than women.

Testing model predictions: Behavioral measures. At the end of three work sessions, subjects selected one of four memos to send to the supervisor. Table 5 displays the number who chose each response. We used tests of differences between proportions to assess the effects of each manipulation on response tendencies. Since subjects could elect to engage in any one of four responses, the absolute number engaging in each response was low and tests of differences in proportions for each individual response were relatively weak. Therefore, in each test we combined two conceptually related categories of response. For each independent variable, we examined differences in tendencies toward constructive responses (voice plus loyalty) rather than destructive responses (exit plus neglect) and toward active responses (exit plus voice) rather than passive responses (loyalty plus neglect). As predicted, in comparison to participants in the low-satisfaction condition, those in the high-satisfaction condition were more likely to engage in constructive responses and less likely to engage in destructive responses. Subjects in the low-investment condition were more likely to react constructively and less likely to react destructively. The effect for exit was weak. Compared to subjects with low-quality alternatives, those with good alternatives were more likely to react actively and less likely to react passively; those effects were strongest for exit and neglect. As expected, the quality-of-alternatives manipulation did not affect behaviors along the constructiveness-destructiveness dimension, and neither the satisfaction nor investment manipulation affected behaviors along the activity-passivity dimension. There were too few observations per cell to explore interactions or gender effects.

DISCUSSION

Meta-analytic techniques were employed to combine information and develop summary probability estimates across the three studies (Rosenthal, 1983). Table 6 presents the results of those analyses. In calculating overall z-scores we used the following information: For study one we employed univariate Fs for each main effect. For study two we employed univariate Fs for each regression coefficient. For study three we employed univariate Fs for each main effect for the self-report measures and z-scores for individual contrasts for the behavioral measures, weighting each resultant z by .5. Thus, each study was equally weighted in the final combined statistic for each effect.

The results of the three studies provide very good support for the proposed theory. Consistent with the first hypothesis, high job satisfaction fairly consistently promoted the constructive voice and loyalty responses and inhibited the destructive exit and neglect responses. And consistent with the second hypothesis, high levels of investment fairly consistently encouraged voice and loyalty responses and inhibited exit and neglect. Finally, consistent with the third hypothesis, the possession of high-quality alternatives

TABLE 6
Meta-Analysis of Results: Studies One, Two, and Three[a]

	Exit	Voice	Loyalty	Neglect
Impact of job satisfaction	5.97***	1.77*	5.07***	2.49**
Impact of investment size	2.52**	2.26**	1.78*	2.91**
Impact of quality of alternatives	6.05***	3.74***	2.25**	1.50

[a] Values are z-scores from a meta-analysis. For each study, z's were: study one, univariate F for each main effect; study two, univariate F for each regression coefficient; study three, [(univariate F for each main effect, self-report measures) + (z for individual contrasts, behavioral measures)]/2.

*$p < .05$, one-tailed test.

**$p < .01$, one-tailed test.

***$p < .001$, one-tailed test.

encouraged high levels of the active exit and voice responses and inhibited loyalty, although this effect was somewhat inconsistently observed. However, there was very little evidence of a link between quality of alternatives and tendencies toward neglect.

Although the simple effects of satisfaction and investment on voice were weak, in all three studies investment interacted with satisfaction in influencing voice. High investment size most strongly promoted voice given high satisfaction. It may be that voice is regarded as a difficult and costly action, and that workers engage in voice only when their motivation to improve conditions is especially strong. Also, in studies one and two this interaction was most pronounced for women: Men behaved as predicted, exhibiting a higher tendency to engage in voice as a function of high investment and satisfaction; women voiced when conditions were most supportive of voice (given high investment and high satisfaction) or when they had nothing to lose (given low investment and low satisfaction). This finding is consistent with work on responses to decline in close relationships, where it has been found that women voice in a wider range of settings than do men (Rusbult, Johnson, & Morrow, 1986). In fact, study three's finding that men engage in higher levels of neglect than do women may in some sense be the mirror image of this result, given that voice and neglect are conceptual opposites.

The prediction that received the weakest support was that concerning the impact of quality of alternatives on neglect. Support for this prediction came from previous absence research, which suggested that neglect may be a substitute for exit, especially when market conditions prevent employees' quitting (Porter & Steers, 1973; Rosse & Miller, 1984). This line of reasoning is intuitively compelling, but in light of the present findings we propose the use of a broadened definition of alternatives, one that takes into consideration not just market conditions but *all* alternative activities that place restrictions on or provide alternatives to a current employment situation. It may also be that quality of alternatives asserts asymmetrical effects. Perhaps having good alternatives encourages an individual to do something; good alternatives may provide the motivation and power to "shape up or ship out." However, the reverse may not necessarily be true—people with poor-quality alternatives are not necessarily driven toward greater and greater passivity.

Study three revealed that over the course of an unfolding period of dissatisfaction, employees showed increased intentions to engage in exit, voice, and neglect and evidenced reduced loyalty. This finding suggests that there may be interesting temporal aspects of responding to job dissatisfaction. It is possible that there are natural progressions in response mode, such that loyalty is more probable as an initial response than it is following another reaction, like voice. Indeed, this may be particularly true if dissatisfaction persists or conditions decline further. It is also possible that loyalty and the other responses are mutually exclusive, so that engaging in exit or voice or neglect implies that an individual is *not* likely to be engaging in loyalty. However, such a speculation is clearly tentative at present and remains to be explored in future work.

Several limitations of the present work should be noted. First, only study two examined actual employees in real organizational settings. Future investigators will need to assess the validity of the present model across varied employment settings. Second, none of the three studies measured actual behavior. Study three obtained somewhat behavioral measures of response intentions, but future research will need to examine the relations among model variables and actual measures of exit, voice, loyalty, and neglect such as absence behaviors and grievance filing. Third, with the exception of study three, the present work was primarily static. In future research it will be important to explore dynamic aspects of responding to job dissatisfaction, including the processes by which employees move from one mode of response to another, probable combinations of responses, and the intensification of responses over the course of an extended period of declining satisfaction. Fourth, the present model does not include the impact of individual-level characteristics on response tendencies. Previous research has shown that needs, stable attitudes, traits, and other enduring dispositions influence important organizational behaviors such as quitting, attendance, and performance (Spector, 1982; Steers & Braunstein, 1976). A fifth point is that broad organizational characteristics such as size and culture may serve as moderators of the causal relationships examined in the present work. For example, our findings regarding the interaction of satisfaction and investment in influencing voice may be illuminated by Freeman and Medoff's (1984) work on industrial relations, suggesting that institutional factors may enhance felt efficacy and resultant voice tendencies. And sixth, although the present work may serve as the basis for a theory of employee retention, the precise means by which practitioners should modify organizational policies so as to maximize desirable employee behaviors remain to be carefully explicated. Detailed research on individual responses and on specific organizational programs and policies may enhance our ability to predict the effects of innovative personnel and management actions. For example, do pay milestones and golden handcuffs—policies designed to discourage exit—also inhibit destructive neglect?

Several strengths of the present work are also noteworthy. First, the consistency of our findings across three studies with quite varied research strategies reveals that the current findings are not method-specific. Second, by employing a variety of measurement techniques, we demonstrated that the theory's predictions are valid for both self-descriptions and behavioral tendencies and that the predictions are valid for both reactions to particular work situations and more general behavioral tendencies. Third, by exploring relationships among predictors and criteria that were fairly broad, heterogeneous, and abstractly defined, we uncovered some general principles about behavior in organizations, thus integrating findings from disparate studies that have explored rather specific functional relationships.

The present approach extends our theoretical understanding of employee responses to job dissatisfaction in several important respects. First, it is noteworthy that the present model identifies multiple dimensions that differentiate among the various responses to decline and emphasizes the diversity of factors that enter into the prediction of response tendencies. This approach suggests that although progression theories (Beehr & Gupta, 1978) may capture some important features of response patterns, the various reactions to job dissatisfaction do not simply unroll in increasing intensity. Instead, critical features of an employee's unique employment situation are clearly important influences on the four types of response. Second, in the current model employees' attempts to change their organization are viewed as constructive responses to dissatisfaction, as recuperative mechanisms, and (at least in part) as attempts to protect investments made over the course of employment. Responses such as grievance filing have previously been accounted for primarily by reference to employee dissatisfaction and the presence of unions (Dalton & Todor, 1982). Third, the present approach views employees as sensible, somewhat thoughtful, and frequently planful; individuals are characterized as active controllers of events and outcomes in a work setting, responding in predictable ways to current situational factors. In contrast, in some models there has been greater emphasis on irrational cognitions, emotions, or unconscious conditioning. For example, Mowday, Porter, and Steers (1982) emphasized the power of affective forces in predicting employees' efforts to change work situations, and proponents of adaptation models (Rosse & Hulin, 1985; Rosse & Miller, 1984) have assumed that conditioning, role models, and social norms are important influences on responses.

CONCLUSIONS

The current work contributes to the understanding of behavior in organizations by outlining and empirically testing a comprehensive yet parsimonious model of responses to job dissatisfaction. That predictions advanced in our exchange model of exit, voice, loyalty, and neglect responses were supported across a diversity of measurement techniques, research settings, and participant populations provides a high degree of confidence in the validity of the present approach. Ultimately, the primary function of the exit, voice, loyalty, and neglect model may be an integrative one: to provide a broad model of the essential categories of response to dissatisfaction and the essential causes of each form of response. The model may also serve as a common framework—or general theory—into which researchers may incorporate new predictors and additional responses to dissatisfaction. Finally, the present work suggests that the general exchange theory orientation may be a fruitful approach in accounting for employee responses to decline in job satisfaction.

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APPENDIX A

Research Materials and Questionnaire Items, Study One

Simulation Essays[a]

Please attempt to place yourself in the position of X, the major character in the following essay. Try to imagine that person's feelings and attitudes as vividly as you can, considering what it would be like to be in that situation. You may need to read the essay a couple of times before you are completely familiar with the details of the situation. Then complete the attached questionnaire, indicating how you would react if you were in that situation.

Imagine that you are X. You are working for a good company that pays you a *high* salary, and your job involves work that you find to be *really* enjoyable. Thus, *you've felt extremely* satisfied with your job. You've held this position for a relatively *long* period of time; you've worked there for two *years*. Thus, *you've invested a lot of* time *and* energy in your job. Recently you were offered a job by another company that you find to be *very* attractive—the pay is *good* and you believe your work *would be* very challenging *and* satisfying.

Activities at the office where you work had been proceeding smoothly, but in the past week a problem developed. One day this week your immediate supervisor assigned you a report to complete, told you that the project was your primary responsibility, and said you could organize the sections of the report in whatever way you felt was best. Later in the day the office manager (your supervisor's supervisor) stopped by your desk, picked up and read your work, and gave you a long list of instructions regarding how to change your work, including changing the organization of your report. You didn't feel that the office manager's advice was very good, but worried about whether you should do what the manager suggested or complete the report the way you had originally planned. You felt torn between the two courses of action, and felt unhappy about the problem with which you were faced.

Remember, you've worked for this company for *a long* period of time, you find your job to be *extremely* satisfying, and you've recently been offered an alternative job that is *very* attractive to you. How is X going to react to the situation? Answer the following questions as you would if you were X. Record a response for each item using the following scale:

Definitely Would Not React In This Way	1	2	3	4	5	6	7	8	9	Definitely Would React In This Way

Questionnaire Items[b]

Prior satisfaction, manipulation checks

Before the problem emerged, how happy had you been with your job?

Before the problem emerged, to what extent had you been satisfied with your job?

Investment size, manipulation checks

Before the problem emerged, for how long had you been working at your job?

Before the problem, how much time and energy had you invested in your job?

Quality of alternatives, manipulation checks

How attractive is your alternative job offer?

To what extent do you think you would be satisfied if you were to accept your alternative offer?

Exit, dependent measures

I would think about quitting my job.

I would give notice that I intended to quit.

I would accept my alternative job offer.

I would quit my current job.

Voice, dependent measures

I would go to my immediate supervisor to discuss the problem.

I would ask my co-workers for advice about what to do.

I would talk to the office manager about how I felt about the situation.

I would try to solve the problem by suggesting changes in the way work was supervised in the office.

Loyalty, dependent measures

I would hang in there and wait for the problem to go away.

I would stick with my job through good times and bad times.

I would think that my job was probably as good as most.

I would patiently wait for the problem to disappear.

Neglect dependent measures

I would lose motivation to do my job as well as I might otherwise.

I would show up late because I wasn't in the mood for work.

I would call in sick occasionally because I didn't feel like working.

I would put less effort into my job.

I would take a lot of breaks or not work as hard.

[a] Italicized portions of essays are the sections that differed across conditions. There were eight versions of the essay, representing a full 2×2×2 factorial design.

[b] All items for manipulation checks were 9-point bipolar scales. The items for exit, voice, loyalty, and neglect were anchored with 1 = definitely would not react in this way, 9 = definitely would react in this way; these items were randomly ordered.

APPENDIX B

Questionnaire Items, Study Two [a]

Demographic Information Items

The demographic information items measured age, gender, race, marital status, highest year of schooling completed, job title, and personal income.

Independent Variable Items

Satisfaction, independent variable measures

Concrete measures: The concrete measures of job satisfaction assessed feelings regarding pay, co-workers, supervision, chances for advancement, type of work, job security, and working conditions (not very satisfied, moderately satisfied, or very satisfied).

Global measures: If you had to decide all over again whether to take the job you now have, what would you decide? If a friend asked if he/she should apply for a job like yours with your employer, what would you recommend? How does this job compare to your ideal job? How does your job measure up to the sort of job you wanted when you took it? All things considered, how satisfied are you with your current job?

Investment size, independent variable measures

Concrete measures: The concrete measures of investment size concerned the degree to which each of several objects/persons/events would be less valuable or lost if the respondent were to quit the job: friends at work, pleasant community, job security, retirement money, a job he/she felt good at, status, good school/church/doctor/etc.. (give up little, give up some, or give up much). Additional concrete items were 5-point bipolar scales that measured specific job training, transferable education and training, apprehension of moving, duration to familiarity with work setting, community ties, and job and company tenure (for each, number of years and months).

Global measures: Generally speaking, how much have you invested in this job (e.g., time, education and training, personal identity, effort, sacrifices)? Generally speaking, to what extent are there things uniquely associated with this job that you would lose if you were to leave (e.g., retirement money, job security, pleasant community, recreational activities, friends at work, status)? Generally, how much would your life be disrupted if you left this job? All things considered, how much have you "put into" this job?

Quality of alternatives, independent variable measures

Concrete measures: The concrete measures of quality of alternatives assessed respondents' judged likelihood of getting a job as good as the current one but with better pay, nicer co-workers, more satisfactory supervision, more chances for advancement, more interesting work, better working conditions, more job security, and more meaningful work. Additional concrete items were 5-point bipolar scales that measured number of job offers in the last six months (none, one, or more than one), number of workers in the geographical area with similar training and skills, value of respondent's present job skills five years hence, favorability of job prospects given the current economy, estimated duration to find another satisfactory job, and possession of sufficient funds to tide respondent over during search for an alternative job.

Global measures: If you left this job, would your next job probably be better or worse than the job you have now? How hard would it be for you to find a job with another employer with approximately the same income and benefits you have now? How confident are you that you would find a satisfactory job if you were to quit this job? All things considered, how do your alternatives compare to your current job?

Dependent Variable Items

Exit, dependent measures

I have recently spent some time looking for another job.

During the next year I will probably look for a new job outside this company.

When working conditions here decline I think a lot about quitting.

I often think about quitting.

Voice, dependent measures

When I think of an idea that will benefit my company I make a determined effort to implement it.

I have at least once contacted an outside agency (e.g., union) to get help in changing working conditions here.

I sometimes discuss problems at work with my employer.

When things are seriously wrong and the company won't act, I am willing to "blow the whistle."

I have made several attempts to change working conditions here.

Loyalty, dependent measures

I generally say good things about my company even when other people criticize it.

Employees shouldn't criticize this company.

I've found that patience is a virtue at my company—time seems to solve most problems at work.

I sometimes wear clothing (hat, jacket, pin, etc.) that bears the company's symbol or insignia (or I would do so if my company had such clothing).

The people in charge of this company generally know what they're doing.

Neglect, dependent measures

Sometimes when I don't feel like working I will work slowly or make errors.

I try to keep out of sight of my supervisor so I can talk to co-workers, take breaks, or do other personal business (not work).

Now and then there are workdays where I just don't put much effort into my work.

Sometimes when I just don't feel like working I will call in sick.

I care very little about what happens to this company as long as I get a paycheck.

Now and then I arrive at work late just because I really am not in the mood for work that day.

[a] All items were 5-point bipolar scales. The items for exit, voice, loyalty, and neglect were anchored with 1 = definitely would not react in this way, 5 = definitely would react in this way; these items were randomly ordered.

APPENDIX C

Questionnaire Items, Study Three [a]

Independent Variables, Manipulation Checks

Job-satisfaction measures

How adequate is your pay as compensation for this job?

Is that level of pay satisfactory to you?

How does that level of pay compare to the average pay for other newsroom tasks?

Investment-size measures

Was your training specific to the task you were assigned?

Did this training help you perform better at your job?

How helpful would that training be if you were to switch to an alternative job?

Quality-of-alternatives measures

How adequate is the pay as compensation for work on the alternative task?

Would the level of pay for the alternative task be satisfactory to you?

How does that level of pay compare to the average pay for other newsroom tasks?

Decline-in-satisfaction measures

How difficult was your work during this session?

How well do you think you performed during this session?

To what extent was work during this session satisfying?

Dependent variables, self-report items

Exit, dependent measures

I am seriously considering quitting my assigned job for my alternative job.

I am thinking about transferring from my assigned job to my alternative job.

I want to switch to my alternative newsroom job.

I want to trade my assigned job for my alternative job.

I will tell the management that I want to adopt my alternative job.

Voice, dependent measures

I have an idea that I think will improve the feedback system, and I will make a serious effort to implement it.

I want to discuss the evaluation/feedback system with my supervisor.

I want to talk things over with my co-workers to get their help in changing working conditions.

I want to suggest changes in the procedures by which work is assigned or evaluated.

I want to change the way in which things are done in the newsroom.

I want to talk to my supervisor about the difficulty of the job and/or the nature of the feedback.

I will work harder—this job is difficult, but "do-able."

Loyalty, dependent measures

I will say good things about my assigned job even when other people criticize it.

I will patiently wait for the evaluation system to improve.

I think that my job is probably as good as most.

I will quietly stick with my assigned job through good and bad times.

There are some things about the assigned task that bother me, but every job has some negative features.

I will speak highly of the job to friends.

Neglect, dependent measures

I have lost motivation for my assigned job; I might work more slowly or make more errors.

I might call in sick occasionally because I don't feel like working on my job.

I feel like putting less effort into my assigned job.

I will begin to take a lot of breaks and do less work.

I might begin to show up late because I am not in the mood for working at my job.

I have quit caring about my job and will allow conditions to get worse and worse.

I feel like saying something rude to my supervisor.

[a] All items were 7-point bipolar scales, with 1 = not all and 7 = completely or 1 = definitely would not react in this way, 7 = definitely would react in this way. On the response-to-job-dissatisfaction self-report items, subjects were asked to assume that their experience during the previous session represented experiences during a one-month period. The exit, voice, loyalty, and neglect items were randomly ordered.

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HINDSIGHT BIAS AND STRATEGIC CHOICE: SOME PROBLEMS IN LEARNING FROM EXPERIENCE

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Knowing eventual outcomes often distorts later reevaluations of initial decisions. Does training in strategic decision making overcome such bias? In two experiments, advanced strategy students analyzing a complex business case were unable to ignore information concerning the outcomes of decisions made in a case and systematically distorted their evaluations of initial decisions and projections for the future. Research and practical implications are suggested.

Strategic decision making requires managers to engage in a variety of cognitively demanding activities. They must assimilate large amounts of information about their own organization, the environments in which they do or might operate, and possible actions of their competitors, allies, and regulators. They must generate projections about future states of those matters and formulate plans that will maintain or improve the fit between their organization and its future environment, considering periods of as long as 25 years. The exact mix of activities involved and their relative importance has been the subject of vigorous debate (Aaker, 1984; Miles, 1982; Newman & Logan, 1981; Porter, 1980; Quinn, 1980). Regardless of the particular model chosen, it is clear that strategic decision making is a dauntingly difficult intellectual task.

As the sampling of authors just cited suggests, there is disagreement about the tools, skills, and procedures a manager needs to approach strategic decision making. Most writers in the area appear to agree, however, that the development of strategic decision-making skill demands experience and the extensive study of earlier strategic decisions through cases and managerial histories as well as through reflection on the manager's own record. It is the effectiveness of such learning from experience and study that concerned us in the present research.

Suppose a manager is looking back on an important decision made some time earlier and is trying to evaluate the decision process that was used. It would clearly be unfair to take into consideration information that was not,

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We wish to acknowledge the assistance of James P. Logan in the development of this project.

and could not have been, available when the decision was made. The question is not simply "How did things turn out?" but "How well did the decision maker do given the information available at the time?" As with historical evaluations, such as Allison's (1971) evaluation of the Cuban missile crisis or Wohlstetter's (1962) assessment of the decisions surrounding Pearl Harbor, the challenge is to put oneself in the position of the decision makers at the time they had to make their decisions. Strategic decision makers, confronting their own future, must attempt to empathize with the situations their predecessors faced if they are to learn from their predecessors' experience. Can people make that empathic leap into the past when they know the actual outcomes of the decision they are examining?

There is a body of psychological evidence suggesting that the leap is a difficult one. In a pathbreaking study, Fischhoff (1975) presented student subjects with brief (150-word) summaries of either historical situations or psychiatric cases and asked them to assess the probability of four different outcomes for each. Some subjects received no information about what actually happened, and others were told of an outcome but were asked to ignore that information in making their estimates. The results indicated that they were unable to do so: probability estimates were systematically biased toward the outcomes that subjects had been told had actually happened. Further, they were unaware of this shift. They thus judged in retrospect that actual outcomes were somewhat predictable in prospect. Fischhoff labeled this effect the "hindsight bias."

The effect has appeared in longitudinal as well as in purely retrospective studies. Fischhoff and Beyth (1975) asked students, immediately before Nixon's visits to China and the U.S.S.R. in the early 1970s, to assess the probabilities of various events' occurring on those trips (e.g., that Nixon would visit Mao Tse-tung or later declare the trip a success). They recontacted the same students after delays of between two weeks and six months and asked them to recall or reconstruct the probabilities they had originally estimated and to report which of the events they believed had actually happened. Compared to their original estimates, probabilities for events the students thought had happened were recalled as higher and those for events they thought had not happened were recalled as lower. The students were, in short, less surprised by what did or did not happen than they would have been had they recalled their original estimates accurately. Other researchers have reported a similar "knew-it-all-along" effect (Hasher, Attig, & Alba, 1981; Wood, 1978).

Other studies have extended and replicated such results in several medical settings. Detmer, Fryback, and Gassner (1978) found hindsight bias among surgeons appraising a surgical case; Arkes, Wortmann, Saville, and Harkness (1981) found it among physicians evaluating a clinical case; Mitchell and Kalb (1982) among nurses assessing the results of their subordinates' actions; and Pennington, Rutter, McKenna, and Morely (1980) among women assessing their likelihood of receiving positive results on a pregnancy test.

Taken together, those findings raise serious questions about the ability of humans to learn from experience in the model discussed earlier. Research findings suggest that, in retrospect, people see the world as unfolding inevitably toward the present. Outcomes fail to surprise. When outcomes are poor, then, people's evaluations of earlier decisions tend to be biased in an unflattering direction. "I should have known it all along," they feel, puzzled at their poor decision making. The decisions of others tend to be similarly disparaged in retrospect. If the world is so predictable, failures to act effectively must reflect poorly on the competence of the managers involved, on the adequacy of the decision process used, or on both. Hindsight effects, by distorting the interpretation of past decisions, might thus lead a strategic decision maker to ill-advised changes in planning processes or personnel. Indeed, it is possible that the overreliance on formal planning procedures noted by Quinn (1980) and others may be rooted in such overestimation of environmental predictability.

It remains to be shown, however, that hindsight bias is as much of a problem for strategic decision makers as it is for subjects in psychology experiments. Perhaps the combination of formal training and long experience with systematic analysis of realistic cases inoculates such decision makers from the effect. The present study attempted to probe that possibility, using subjects with substantial formal training in strategic decision making. We addressed four specific questions: (1) To what extent are such subjects vulnerable to hindsight bias, given high task involvement and rich case materials? (2) Does group discussion moderate or exacerbate such bias? (3) How is such bias sustained in the face of detailed case knowledge? (4) Do hindsight-biased evaluations of past decisions affect choices of processes or procedures for future decisions?

STUDY ONE

Methods

Subjects. Subjects in study one were 48 M.B.A. students enrolled in sections of a strategic management course in the last semester of their two-year program. Of the 48 students, 18 were women and 30 had professional work experience, generally in entry-level managerial positions. They were relatively experienced in case analysis, having taken a minimum of four and a maximum of ten semester-length case-based courses during their M.B.A. programs.

Procedures. As a regular part of their course workload, the subjects were given a five-page business case to analyze as a take-home assignment and asked to prepare a one- to two-page analysis for the next class, two days later. The case (*Hygeia International*, Newman & Logan, 1980) was a lightly disguised account of a real pharmaceutical company's expanding from veterinary product sales into chick-hatching and egg production in Nigeria. The case materials ran five printed pages and provided a rather detailed account of the background, decision process, and information available to the decision makers.

Three different versions of the case were prepared and distributed to three randomly chosen groups of subjects. The first version provided no outcome information, and the subjects were asked for an analysis of the project's potential for success or failure, with success defined as a 20 percent return on investment (ROI) within two years of start-up. The two other versions reported that the project had been fully implemented and had generated either a 36 percent or a 4 percent ROI from its first full year of operations. We asked students receiving those versions to account for the outcomes in their short analyses. All subjects were asked to work alone.

At the start of the next class period, we collected the written analyses and distributed a three-page questionnaire, assessing the likelihood of the venture's success or failure and the factors that might contribute to either outcome. All variables used in this and in the second study were derived from the questionnaire, which is described in full in the Appendix. Following their completion of the questionnaire, students were assigned into groups to discuss the case and to reach agreement on a shortened version of the questionnaire. Groups were homogeneous as to case version and included three to five individuals, depending on how many students in each condition were available at each class session. They deliberated for between 30 and 45 minutes.

Results

Manipulation check. The experimental manipulation consisted of variation in the levels of first-year ROI embedded in the case: ROI was 36 percent for the high-outcome group, 4 percent for the low-outcome group, and unreported for no-outcome group. For a manipulation check, the instructions asked subjects to predict second-year ROI "using all of the information available to you today." First-year actual ROI would presumably be a salient component of that information—and, as the only difference between the three case versions, the only plausible explanation for any observed differences between groups in second-year ROI predictions. Mean second-year predicted ROI was 25.6 percent, 16.0 percent, and 11.1 percent for the high-, no-, and low-outcome groups, respectively (see Table 1, item s). Analysis of variance showed a highly significant main effect for outcome condition, indicating that the manipulation of first-year ROI was, indeed, salient to the subjects.

Hindsight effects. The questionnaire measures in which the subjects were asked to reassess the initial decisions, pretending ignorance of the actual first-year outcomes, show hindsight effects. The results (see Table 1, first row for each dependent variable) strongly suggest that subjects were not able to ignore the outcome information. Mean estimates of the probability of first-year success (item a) and mean first-year predicted ROI (item b) were higher for the high-outcome subjects and lower for the low-outcome subjects than for the no-outcome subjects. The low-outcome group rated the riskiness

TABLE 1
Means, Standard Deviations, Analysis of Variance, and Jonckheere Results[a]

		Low-Outcome		No-Outcome		High-Outcome		
Dependent Variables	Study[c]	Means	s.d.	Means	s.d.	Means	s.d.	*F* or *z*
a. Probability of success[b]	1	0.29	0.16	0.39	0.21	0.61	0.25	10.15**
	g	0.27	0.68	0.33	0.70	0.62	0.57	2.87**
	2	0.41	0.19			0.66	0.18	11.45**
b. Predicted first-year ROI	1	9.25	4.39	12.41	5.11	15.46	7.67	4.24*
	2	10.67	3.34			21.23	7.35	20.77**
c. Adequacy of information	1	2.25	1.13	2.53	0.80	2.60	0.74	0.66
	2	1.62	0.65			3.08	0.95	20.21**
d. Prediction confidence	1	2.00	0.97	2.12	0.78	2.43	1.16	0.77
	2	1.62	0.51			2.85	1.14	12.30**
e. Perceived riskiness	1	4.06	1.00	3.71	0.92	3.13	1.19	3.16*
	2	3.46	0.78			3.08	0.76	1.20
f. Readiness to invest	1	0.56	0.81	1.63	1.31	3.07	1.22	7.27**
	2	0.92	0.76			2.38	1.19	12.89**
g. State of technology	1	4.94	1.77	5.06	1.75	5.80	1.61	1.14
	g	4.25	1.71	5.40	0.89	6.50	0.58	1.43
	2	5.00	1.35			6.00	0.91	6.49*
h. Hygeia's experience	1	4.94	1.91	5.41	1.54	6.27	0.88	3.03
	g	3.75	2.36	4.20	1.79	6.00	0.00	1.43
	2	4.92	1.80			5.92	0.86	3.93
i. Traditional tribal values	1	3.06	1.88	2.94	1.60	3.67	1.45	0.86
	g	1.75	0.96	2.40	0.89	2.50	1.00	0.26
	2	3.23	1.83			3.77	1.69	0.61
j. Workforce skill level	1	2.87	1.75	3.18	1.55	4.27	1.67	3.02
	g	1.75	0.96	2.80	0.84	3.25	1.26	0.91
	2	3.85	1.63			4.62	1.61	2.82
k. Potential price controls	1	2.33	1.45	3.00	2.06	3.73	1.94	1.92
	g	1.75	0.96	2.40	1.74	2.75	1.26	0.39
	2	3.08	2.25			3.92	1.85	2.45

TABLE 1 (continued)

Dependent Variables	Study[c]	Low-Outcome		No-Outcome		High-Outcome		*F* or *z*
		Means	s.d.	Means	s.d.	Means	s.d.	
l. Nigerian investment policy	1	4.31	2.09	4.47	1.91	5.47	1.41	1.79
	g	4.75	1.89	5.00	1.00	5.50	0.58	0.39
	2	5.15	1.34			5.31	1.18	0.42
m. Nigerian government attitude	1	4.53	1.68	5.29	1.69	5.80	1.90	2.22
	g	3.50	1.73	4.60	1.67	6.25	0.96	1.31
	2	5.08	1.61			6.15	0.99	7.89**
n. Joint venture activities	1	3.93	1.75	4.94	1.30	5.27	1.16	3.83*
	g	4.00	0.82	4.80	0.84	6.00	0.82	1.83*
	2	5.08	0.95			5.08	1.44	0.11
o. Demand	1	4.31	2.41	5.94	1.69	6.13	1.46	4.13*
	g	2.50	1.73	6.20	0.84	5.25	1.71	1.17
	2	5.46	2.22			5.92	1.66	0.66
p. Per capita income	1	3.31	2.15	3.59	1.77	4.00	2.07	0.46
	g	1.75	0.96	2.60	0.89	3.25	2.06	1.31
	2	2.67	1.56			3.83	1.70	3.08
q. Potential import controls	1	3.44	1.97	3.29	1.61	3.33	1.91	0.03
	g	2.00	0.82	2.60	1.14	2.25	0.96	0.78
	2	3.85	1.57			3.69	1.89	0.01
r. Nigerian economic stability	1	3.50	2.34	3.71	2.11	4.13	2.00	0.35
	g	1.25	0.50	3.00	1.41	3.75	2.36	1.57
	2	3.69	1.60			4.00	2.35	0.35
s. Predicted second-year ROI	1	11.06	5.36	16.00	5.85	25.64	6.37	23.74**
	2	13.77	5.54			26.00	9.21	12.70**
t. Would not have entered market	2	0.62	0.51			0.00	0.00	19.02**
u. Confidence in your decision	2	3.23	1.01			3.54	1.05	0.54
v. Recommend continuance	2	0.23	0.44			0.08	0.28	1.14
w. Rate decision process	2	1.69	0.63			2.54	0.88	7.98**
x. Credit/blame locus	2	3.62	0.77			2.69	1.32	4.77*

TABLE 1 (continued)

Dependent Variables	Study[c]	Low-Outcome		No-Outcome		High-Outcome		F or z
		Means	s.d.	Means	s.d.	Means	s.d.	
y. Error cause	2	2.85	0.99			2.69	1.11	0.14
z. Decision timing	2	1.77	0.60			2.69	0.48	18.78**
aa. Personnel evaluation	2	3.23	1.24			2.85	1.52	0.50
bb. Autonomy shift	2	3.69	1.03			3.08	1.04	2.30
cc. Decision review	2	3.00	1.08			3.15	1.14	0.12
dd. Information search	2	2.08	0.86			2.92	0.95	5.63*

[a] Jonckheere nonparametric z scores are reported for all group measures under F or z. For a description of the Jonckheere statistic, see Lehmann (1975).

[b] Ns = 48 for study one, 26 for study two, and 13 for group results.

[c] 1 indicates study one, individual responses; g indicates study one, group responses; and 2 indicates study two, individual responses.

* $p < .05$

** $p < .01$

of the initial decision higher than did the others (item e) and would have been more reluctant to invest $1,000 of their own money in the venture (item f). It is thus clear that knowledge of first-year results shaped subjects' retrospective assessments of the initial decision, even when they were told to ignore that information.

Process assessments. Two items probed the subjects' evaluations of the decision process used: their rating of the adequacy of the information used and their confidence in making ROI predictions from that information (Table 1, items c and d). Both ratings tended to be lower for the low-outcome than for the high-outcome group, though neither difference reached significance.

Factor ratings. Subjects evaluated 12 factors drawn from the case as to their positive or negative effects on the project's outcome (Table 1, items g–r). For 11 of those items, high-outcome subjects rated the factor as having had a more positive effect than did low-outcome subjects (sign test: $p < .01$), with the no-outcome mean falling in between for 10 of the 12. One-way analysis of variance showed significant between-group differences for two items (n and o) and marginally significant effects ($p < .10$) on two others (h and j).

Extending the consideration of the cases by group discussion for 30–45 minutes appears to have had little effect (Table 1, rows marked "g"). Mean group ratings of the initial probability of success closely match the individual means reported above (Table 1, item a). Group ratings of the 12 possible causal factors generally tend to be a little lower than the mean individual ratings, but there is no evidence of reduction of the outcome-induced hindsight effects. One item (n) shows a significant between-group effect, and several items (g, h, m, p, and r) show marginally significant ($p < .10$) effects, all in the predicted direction. Overall, the hindsight effects demonstrated for individuals appear robust to the effects of discussion in groups homogeneous as to outcome and to the extended reflection and evaluation that such discussion implies.

Discussion

The results strongly indicate that these advanced strategy students were vulnerable to hindsight bias. When given, but then told to ignore, first-year results of an investment project, those who were told of favorable outcomes rated the project as more promising, less risky, more likely to succeed, and more attractive for a personal investment than did others told of less favorable results; subjects given no outcome information fell in between. The shift does not appear to be the result of any wholesale reevaluation of one or two aspects of the project. Rather, the subjects made modest shifts in their assessments of a large number of different factors. They were then able to weave those assessments together into satisfactory accounts that, though drawing on identical sets of facts, led to diametrically opposite conclusions. Group discussion did not overcome the effect, at least in groups homogeneous as to outcome.

As suggested earlier, such hindsight effects might influence the way an observer evaluates a decision process and allocates praise and blame to the participants. Such evaluation might, in turn, lead to redesign of the process or replacement of the participants, so that a distorted reading of the past could generate undesirable consequences in the future. To probe this possibility, we added several process-related items to the questionnaire (see the Appendix) and replicated the study with a new group of strategy students.

STUDY TWO

Methods

Subjects and procedures. Subjects were 26 M.B.A. students enrolled in a later offering of the same course the study-one students had taken. Because the number of subjects available was modest, we used only the high-outcome and the low-outcome versions of the original case. As before, students received the case materials as a take-home assignment for a one-to-two-page analysis due two days later. They completed questionnaires at the start of the subsequent class. There was no subsequent group discussion.

Results

The results (also summarized in Table 1) provide a partial replication of the findings from study one. The manipulation of first-year outcome appears to have been successful (item s). Differences between the low-outcome and high-outcome groups in assessments of the decision process (items c and d) were in the same direction as in study one, and they reached statistical significance. Substantive measures of hindsight effects (items a, b, and f) reached statistical significance, as they did in study one. Results for item e, perceived riskiness, which were significant in study one, failed to reach significance in study two. Factor ratings (items g–r) all showed shifts similar to those found in study one.

Several findings from the second study suggest the sorts of effects hindsight bias may have on appraisals of decision processes. Reflecting study one's findings that the low-outcome subjects perceived risk as high and had a strong reluctance to invest their own money, the later findings showed that the second group of subjects split decisively on the question of whether or not they would have gone ahead (item t). All the high-outcome subjects indicated that they would have, but only 38 percent of the low-outcome subjects so indicated. Interestingly, both groups felt equally confident in this go/no-go decision (item u), suggesting once again the self-sealing nature of the hindsight effect. On identical evidence, one group was unanimously in favor, the other heavily against, the project; both were equally confident of their decisions.

Outcome information also affected evaluation of the decision process used. Low-outcome subjects rated the decision process less positively than did high-outcome subjects (item w), judged the timing of the decision to have been poorer (item z), and felt that more information should be gathered before decisions were made in similar situations in the future (item dd). Despite the overall disparagement of the decision process by the low-outcome subjects (item w), no significant differences between conditions emerged in assessments of several specific aspects of the process (items y, aa, bb, and cc). However, an interesting shift was found in overall assessments of whether the outcome was due more to the decision process or to the individuals involved (item x). High-outcome subjects tended to assign credit to the decision process, and low-outcome subjects assigned blame to the decision makers involved. In short, high- and low-outcome subjects differed in their overall assessments of the decision process, its timing, the adequacy of the information gathering, and the relative importance of process and decision makers in forming the outcome.

DISCUSSION

The results reported here indicate that advanced strategic planning students are significantly vulnerable to hindsight bias. When told, but then asked to ignore, the results of a complex investment decision, they were unable to do so. They shifted their retrospective predictions of project success in the direction of the known outcomes. Given varying information, they differed in their assessments of whether the project should have been undertaken in the first place but held their positions with equal confidence. Those told of favorable outcomes saw the initial decision as less risky and more attractive for a substantial personal investment than did those told of an unfavorable outcome. Those told of unfavorable outcomes rated the decision process as poor, believed the initial decision was made too quickly, and felt that more time should be taken with future decisions even if it meant missing market opportunities. Those told of favorable outcomes rated the process as adequate, saw the timing of the decision as about right, and judged the balance between information gathering and timely action as appropriate.

Those contrasting readings of the case do not appear to result simply from one outcome's flowing more plausibly from the facts given than does the other. It appears, rather, that subjects assimilated the outcome information provided by making modest shifts in numerous aspects of the story they invented to account for the facts. The availability of detailed factual materials appears to do little to constrain the accounts generated: success or failure seem equally explicable from identical facts. Given reasonably rich historical materials, as in a business case study, it appears that people can assimilate quite divergent outcomes without differential strain into a coherent story. Extensive discussion in small groups homogeneous as to information about outcome does not appear to change the process. Finally, knowledge of outcomes appears to change a variety of evaluations of the processes and people involved in making decisions.

The results of the two studies, then, extend somewhat the domain of subjects and tasks for which hindsight effects have been demonstrated. The original demonstrations found in the literature used Israeli undergraduate social science students evaluating unfamiliar retrospective tasks (Fischhoff,

1975) or decisions concerning real current events (Fischhoff & Beyth, 1975). The present results reemphasize Fischhoff's (1982) conclusion: "There is little experimental evidence that hindsight bias is reduced by the sort of intense involvement with a topic that comes with a professional education" (1982: 430). Further, the effect appears robust to the effects of extended consideration of the task, at least to the extent that such consideration is involved in preparing a one- or two-page written analysis and in later discussion for 30 to 45 minutes.

Clearly, the present work needs to be extended to real decision makers and real decisions. Caution is, as always, needed in extrapolating from studies of M.B.A. students to the behavior of seasoned professional managers. The present group of subjects, we would argue, represents a useful improvement on experiments with naive students working briefly on unfamiliar problems outside their professional expertise. The problems were of high professional relevance to the student subjects; they were extensively trained in case analysis and spent significant time on the analyses, both individually and in groups. The results do not suggest that any of those factors eliminated hindsight bias. A further extension, to professional planners and plans, would be required to fully address the question, under what circumstances and to what extent do professional strategic planners fall victim to hindsight bias?

If the effect persists in real settings, it becomes still more important to understand the dynamics of the process by which such revisions of probability occur and to test possible remedial strategies. The evidence to date suggests that hindsight bias is rather stubborn, at least to the extent of persisting in the face of clear warnings of the effect and a variety of task restructurings. Fischhoff (1982) summarized debiasing efforts. Some improvement was noted in a study by Slovic and Fischhoff (1977) in which the subjects were required to develop detailed explanations for the occurrence of the outcomes that did not happen. Such reinterpretation of evidence to support opposing conclusions appears to be a key element of adversarial or dialectical planning techniques like those advocated by Mitroff and colleagues (Finney & Mitroff, 1986; Mitroff & Emsholf, 1979). We know of no study that has demonstrated the effectiveness of such techniques in overcoming hindsight bias. Research along that line appears promising.

A second promising research direction involves a shift to a longitudinal design in which the same actor would make a series of decisions over time. Such designs would allow study of a crucial feature of hindsight bias: the possible mechanisms by which a manager's distorted view of the past might influence decision making in the future. We suggested earlier the possibility of a link between overestimation of environmental predictability and the excessive reliance on formal planning models noted by Quinn (1980) and others. In the present data, we were intrigued by the finding that high-outcome subjects credited the decision process, and low-outcome subjects assigned blame to the decision makers involved. This result contrasts with findings from the literature on the "romance of leadership," where positive outcomes tend to be attributed to leaders, negative results to the environment (Meindl &

Ehrlich, 1987; Salancik & Meindl, 1984). There appears to be important research potential in better understanding the relationships over time between assessments of prior decisions, evaluations of the people, processes, and environments involved, and the shaping of future strategic choices.

In summary, we suggest that the data reported here raise serious concerns about the presence of hindsight bias in strategic decision making. Well-trained student subjects working on a strategic choice case, both alone and in groups, were unable to ignore what they had been told about the actual results of a choice. As a result, they distorted their evaluations of the original decision and the factors influencing it. It is possible that a real strategic decision maker, experiencing the same bias, would evaluate an organization's environment as more predictable, and the relevant managers as less competent, than they actually were, with distorting effects on future strategic decision processes. Such distortions would be of obvious importance for both the design of strategic planning processes and the evaluation of their participants. The area appears to offer significant further research potential.

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APPENDIX
Questionnaire Measures

All items were included in both studies, except for those specifically marked "study two only." Except where otherwise noted, responses were on 5-point formats, anchored as shown.

Assume that the decision to enter agricultural production in Nigeria was made in 1983. *Imagine that you are back at the point in time.*

Probability of success: With only the information you would have had in 1983, state what you believe to be the probability of success and the probability of failure for the first full year of operations (1985) of the Nigerian chick-farming venture. (A successful operation would meet the 20% ROI goal, an unsuccessful operation would fall short of that goal.) Be sure the two probabilities add to 100%.

Predicted first-year ROI: What would your best estimate have been of the ROI figure for 1985 (the first full year of operation)?

Adequacy of information: Was the available information adequate for making a decision of this significance? (completely inadequate = 1 and completely adequate = 5).

Prediction confidence: How confident do you feel making these ROI predictions from the information available in 1983? (not at all confident = 1 and completely confident 5).

Perceived riskiness: How risky would you rate the decision to go ahead? (very low risk = 1 and very high risk = 5).

Readiness to invest: Would you have been prepared to invest $1,000 of your own money in this project? (definitely would invest = 1 and definitely would not invest = 5; reverse-scored, so that high scores indicated greater readiness).

Would have entered the market: Putting yourself in Mr. Livingstone's position at the time of the original decision to enter the chick business, would you have entered the market? (yes/no response, study two only).

Decision confidence: How confident would you be in your decision? (not confident = 1 and confident = 5, study two only).

Factor ratings: How important would you rate the following factors in influencing the success or failure of the Nigerian chick-hatching business? (7-point scales with important negative effect = −3, no effect = 0, and important positive effect = +3). Table 1 lists the factors as items g through r.

Using all of the information available to you today:

Predicted second-year ROI: What is your best estimate of the ROI figure for 1986 (second full year of operation)?

The following items were used in study two only.

Recommend continuance: Should Hygeia continue this project? (yes/no response).

Rate decision process: Rate the strategic decision process utilized in the case (poor = 1 and excellent = 5).

Credit/blame locus: Does the credit/blame for the decision in this case lie primarily with the process or with the decision makers? (process = 1, 50/50 = 3, and decision makers = 5).

Error cause: As it turned out Murtala's original estimate of ROI was substantially in error. Do you attribute this error to the difficulty of making estimates in situations like this or does the fault lie in Murtala's estimating ability? (Murtala is the manager in Nigeria). (Error mainly due to Murtala = 1, 50/50 = 3, and situation = 5.)

Decision timing: The timing of the Hygeia decision, like many business decisions, represents a balance between moving too early, before enough information is available, and moving too late, after the good opportunities have been taken. Would you say Livingstone (Hygeia's U.S. manager) moved: (too early = 1, about right = 3, and too late = 5).

Personnel evaluation: Who do you think deserves the most credit/blame for the outcome in this case? (Murtala = 1, 50/50 = 3, and Livingstone = 5).

Autonomy shift: Should Murtala have more or less autonomy in future decisions? (more autonomy = 1 and less autonomy = 5).

Decision review: In the future, should someone in a position of authority over Livingstone review his decisions prior to implementation? (should not review = 1 and should review = 5).

Information search: Imagine yourself in Mr. Livingstone's position in the future. A decision of similar complexity arises. You have the option of gathering more information on market conditions prior to deciding but would do so knowing that your competitors may beat you into the market. Would you seek out additional information? (seek more information = 1 and make decision now = 5).

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ORGANIZATION STRUCTURE AND CORPORATE SOCIAL PERFORMANCE: A FIELD STUDY IN TWO CONTRASTING INDUSTRIES

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The relationship between public-affairs management structure and social performance was studied. We explored three dimensions of public-affairs management structure—receptivity to public affairs information, integration of public affairs information, and internal influence of public affairs—in two contrasting industries, insurance and forest products. Balanced strength along each of the three dimensions of public affairs management was found to be associated with high social performance in both industries. The pattern was more consistent for companies at the extremes of social performance ratings than it was for middle-ranked companies. In addition, differences in the institutional environments of the two industries were associated with differences in the various components of public affairs structure.

Over the last two decades, the managerial significance of issues in the public affairs sector of the business environment has matched that of issues in the market and technological sectors. Large corporations have responded to new institutional pressures with new job titles and increased resource commitments to public affairs (Brown, 1979; Marcus & Irion; 1987; Post, Murray, Dickie, & Mahon, 1983; Wartick & Rude, 1986). Organization theorists, however, have given little consideration to how these structural changes actually affect companies' responsiveness in the public affairs domain. Much of the literature on business and society reflects an external perspective in which internal variables receive little attention, and most of the research is anecdotal or deals with single case studies. By contrast, the literature on organization-environment adaptation has employed more systematic research methods and data and has focused on internal firm structure. However, that literature has not explicitly studied the organization of public affairs management. The present research was intended to fill this gap by using organization theory concepts to explore the relationship between companies' internal public affairs structures and their responsiveness to the public affairs environment in two contrasting industries, forest products and insurance.

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LITERATURE REVIEW AND MODEL

Organizational theorists have identified various characteristics of the business environment, including scarcity, turbulence, complexity, and perceived uncertainty (Downey, Hellriegel, & Slocum, 1975; Duncan, 1973; Emery & Trist, 1965; Lawrence & Lorsch, 1967; Miles & Snow, 1978; Thompson, 1967; Tung, 1979), and have studied its effects on organizational structure. An important feature shared by previous research is a focus on the market and technological aspects of the business environment. The writers who have discussed institutional and organizational legitimacy (Aldrich, 1979; Hannan & Freeman, 1977; Parsons, 1960; Pfeffer & Salancik, 1978) have not measured company performance in the public affairs environment or developed a theory of the internal structure of public affairs management.

Analysts concerned with business and society have, however, pointed out that issues in public affairs have become as complex and turbulent as the traditionally recognized market and technology components of the business environment (Carroll, 1978; Hargreaves & Dauman, 1975; Miles, 1982, 1987; Post, 1978; Preston & Post, 1975; Sethi, 1977). Those writers have also demonstrated the compelling nature of problems at the corporate-public interface. Miles (1982), for example, in his longitudinal study of the tobacco industry, chronicled the fundamental strategic changes among major tobacco companies as a result of the 1964 surgeon general's report linking cigarette smoking to the incidence of lung cancer. Similarly, Post (1978) studied the effects of public issues and corporate responsiveness on corporate performance in a range of diverse industries, including consumer products and insurance. Both authors used case studies to demonstrate the impact of ineffective social responsiveness on bottom-line corporate performance and long-term survival.

Some researchers, focusing on specialized aspects of the business-society interface, have related a firm's internal characteristics to its external social performance. That connection has been made, for example, in the context of changing public opinion (Brenner, 1979; O'Toole, 1979), government regulation (Kasper, 1978; Leone, 1977), and labor relations and human resources (Perry & Angle, 1979; Sonnenfeld, 1978). It is evident from the research cited that large corporations may exacerbate problems because their internal structures are poorly designed to receive and process public affairs signals. For example, group-level responses and reliance on trade associations are insufficient when competitive differences and variations in business exposure require a firm-level response (Miles, 1982). Organizational theorists can thus contribute to the important externally oriented discussions in the business and society literature by looking at how public affairs structures within firms can be altered to facilitate greater social responsiveness on the part of individual companies to public affairs issues.

In light of our recognition that the public affairs environment is complex and volatile, the conclusions of both contingency theorists (Downey et al., 1975; Duncan, 1972; Lawrence & Lorsch, 1967) and proponents of the information-processing view (Aguilar, 1967; Galbraith, 1973; Tushman &

Nadler, 1978) suggest that firms need differentiated boundary-spanning units. As boundary spanners, such units act as receptors that collect and transmit information to an organization. The organization is more or less receptive to the introduction of new public affairs information to the extent that boundary-spanning units commit appropriate resources and time to tracking a broad range of environmental contingencies. An organization's receptivity, defined in terms of both the breadth of outside contacts that company executives maintain in the public affairs environment and the depth, or length of time of company involvement with specific issues, affects both the richness of the organization's internal perceptions of the outside environment and its responsiveness to it. Thus,

> *Hypothesis 1: Companies that show high receptivity to public affairs information exhibit strong social performance.*

Contingency-school theorists also emphasize the establishment of interunit coordinating structures that reflect environmental uncertainty and the interdependence of organizational units. Given the variety of interest groups and diverse sources of information in the public affairs domain (McGrath, 1976, 1979; Sethi, 1977), organizations need integrating mechanisms to coordinate the specialized information collected by boundary-spanning units into a coherent picture of that domain. An organization whose environmental perceptions are driven by its public relations officials might tend to over emphasize relations with the media, whereas an organization in which government lobbyists prevail might focus on legislative needs. Because different groups have different backgrounds and professional orientations, if any one group tends to dominate an organization's environmental perceptions, the organization will have a less coherent vision of the outside than the vision that would come from an effective integration of the various points of view. All the actors have information-gathering biases—time orientations, professional languages, networks, and so on—that affect their individual perspective. Previous investigators have illustrated distorted perceptions due to executive role bias both in the laboratory (Dearborn & Simon, 1958) and in the field (Sonnenfeld, 1981b).

> *Hypothesis 2: Companies that have effective integrating mechanisms to coordinate their public affairs information exhibit strong social performance.*

Prior research in public affairs management (Holmes, 1978) has indicated that although many integrating mechanisms are possible in public affairs—including the use of integrator roles and reliance on planning processes—multidisciplinary team approaches such as task forces are the most widespread. Preliminary observations in the forest products and insurance industries also revealed to us that the issues facing the companies observed required a constant coordination of functional expertise in such areas as law, communications, and operations. In addition, all companies used newsletters as one mechanism, and none had all the different functions reporting to a single individual, so we focused on the mechanisms in which we expected to find some variation. Thus, we defined integration in terms of the frequency of use of task forces and the degree of establishment of steering committees in public affairs.

Although contingency theorists have encouraged the study of differentiated boundary-spanning units and interunit coordinating structures, more recent writers have added an emphasis on the need to consider the acquisition and maintenance of power by those units (Miles, 1980; Pettigrew, 1975; Spekman, 1979). In the public affairs domain, maintaining the importance and visibility of public affairs information becomes an especially important responsibility of top management because in the absence of visible support from top management, pressures for short-term performance on line managers tend to override the relatively long-term consequences of public affairs imperatives (Ackerman, 1975; Ackerman & Bauer, 1977; Bhambri & Miles, 1980). Thus, consistent top-management support and involvement are necessary to reinforce the importance of public affairs in an organization's scheme of priorities.

> *Hypothesis 3: Companies in which public affairs activities have great influence in general management decisions exhibit strong social performance.*

We defined the internal influence of public affairs in terms of its importance (1) in matters that affect an organization's context, including how much time and attention the chief executive officer (CEO), board of directors, and annual planning process gave to public affairs, and (2) in the organization's executives' personal career progress, performance appraisals, career paths, and training programs.

Companies with a strong internal public affairs structure were expected to achieve strong social performance ratings, as defined by stakeholders' perceptions of company responsiveness to public affairs. The characteristics of the institutional environments of the two industries studied differed in that the forest products industry had fragmented stakeholders (Sonnenfeld, 1981a) and the insurance industry's stakeholders were more concentrated (Miles & Bhambri, 1983). However, we expected to observe similar relationships and a similar level of sophistication in the structure of public affairs management among the largest companies in both industries because of the high salience of public policy issues in both.

METHODS

Industries Studied

We examined the external social performance and the internal corporate structure of 13 large companies from two different industries—forest products and insurance—each of which has performed under intense public scrutiny. Forest products has been a major consumer of natural resources and a vital supplier. Its public affairs interactions have been scattered across a broad array of outside stakeholders, such as state and federal regulators, legislators, special interest groups, and labor unions. The insurance industry has similarly been subjected to intense public scrutiny. Because insurance products touch almost every segment of society, issues in this industry tend to become politicized easily. However, as a regulated industry, its public affairs contacts have been far more limited than the forest products industry's and have primarily involved the state commissioners of insurance who regulate the insurance industry in the "public interest." By examining public-affairs management structure in both a nonregulated manufacturing industry and a regulated service industry, we sought to explore whether there were similarities in patterns of social performance despite industry differences.

Since we presumed that the size of a company might affect its exposure to public affairs, we approached only the largest companies in each industry with requests to cooperate with this research. Each of the forest products firms reported in excess of $3 billion in sales. The insurance firms all had assets in excess of $1 billion.

Data Collection

We wrote letters to the CEO of each firm explaining that participation would help the company evaluate its efforts and successes at managing public affairs against those of competitors. Supporting documents sent with the letter included published articles on public affairs by us. Six of the ten forest-product companies responded favorably. In the insurance industry, seven of the nine companies solicited responded favorably. Nonparticipating companies did not systematically differ from those that did participate in terms of the dependent variable, social performance ratings, or in terms of strategic position as measured by size, geographic location, product-market mix, and financial performance. They ranged along the social performance continuum of the participating companies and clustered with the participants in terms of strategic position.

The participating companies represented substantial geographic diversity. Of the forest products firms, two had headquarters on the East Coast, two on the West Coast, one in the mountain states, and one in the lake states. Each of the companies had substantial land holdings and major facilities in the Pacific Northwest, the South, and the Northeast. According to interviews with outside stakeholders (union leaders, environmentalists, and regulators), the participating companies represented as wide a range of public affairs performance as could be found in the industry. Also, each of the companies had fully integrated marketing and operations activities, ranging from forest management through producing finished wood and paper products. Similarly, the insurance companies had business activities in all the major sectors of their industry, ranging from life and health insurance to property and casualty insurance. Also, like the forest products companies, all the insurance companies operated throughout the country. Three had headquarters located in the Northeast and four had headquarters located in the Midwest. Again, through stakeholder interviews (with state insurance commissioners), we learned that the participating companies represented a wide range of levels of public affairs performance.

Interviews with company officials and stakeholders preceded distribution of surveys. We held roughly 15 interviews within each company in the forest products industry, for a total of 90 interviews. Included among the executives interviewed were the CEO; the senior vice presidents of the major line divisions (timber, pulp, and paper); and the vice presidents of human resources, government relations, and public relations. Interviews, which lasted a minimum of one hour, were held at corporate headquarters. We developed a list of 33 stakeholders who were mentioned ten times or more as key stakeholders in the executive interviews and who appeared in press clippings on industry events. We then interviewed the 33 to develop and later test the stakeholder questionnaire. Through this second round of interviews and an extensive industry analysis (Sonnenfeld, 1981a), we constructed a panel of 150 forest-industry stakeholders. The panel was composed of investment analysts, trade union leaders, officials of environmentalist organizations, state regulators, federal regulators, state legislators, federal legislators, congressional staffers, trade association officials, and forestry school professors. Stakeholder questionnaires, designed to assess the social performance of forest products companies, were mailed in June 1980. By August, we had received 75 (50%) completed questionnaires.

The survey procedure for assessing corporate social performance in the insurance industry was simpler, since its public interface is considerably more narrow (Miles, 1987; Miles & Bhambri, 1983). The investigation in this industry began with a series of on-site interviews with senior officers of the National Association of Insurance Commissioners and with a national cross section of state insurance commissioners, representing 7 urban and 5 nonurban states. We inquired about the role of the insurance commissioner and about the phrasing of potential questions pertaining to rating the social performance of the leading insurers. The commissioner survey was administered in the fall of 1980 to insurance commissioners in the 50 states, the District of Columbia, and the three U.S. territories. We received questionnaires from 34 (63%) of the commissioners. Participating commissioners represented both urban and nonurban states and were evenly distributed throughout the country.

The dimensions of internal management of public affairs were assessed through executive surveys. The forest-products executive survey was distributed to the industry at the end of the first quarter of 1980. Each company received 30 questionnaires and a list of potential respondents from the following areas: legal, finance, planning, general management, government, line operations, public relations, human resources, engineering, and environmental management. Responses were mailed directly back to us, and 141 of the 180 questionnaires distributed (78%) had come back by the end of the second quarter of 1980. Each company's employees returned from 15 to 28 of their 30 questionnaires, with all but one of the companies returning at least 75 percent of their questionnaires. Individual respondents were fairly evenly split between functions, with 45 percent in public affairs departments like law, public relations, and government affairs and 55 percent in such other departments as finance, planning, general management, human resources, and environmental engineering.

The insurance-executive survey was administered one year later than the forest products survey, with distribution and return of the questionnaire in the second and third quarters of 1981. The overall response rate was also quite strong, with 73 out of 82 executives (89%) completing the questionnaire. Each company received between 9 and 16 questionnaires, depending on the number of line and staff officers in the firm. The response rate by company ranged from 80 to 100 percent. The functions were again split fairly evenly, with 53 percent of the respondents in public affairs positions and 47 percent in other positions. Table 1 summarizes the various data collection phases and instruments.

Measurements

The stakeholder survey for the forest products industry rated the six firms studied along with the 20 largest firms in the industry on a general question of social responsiveness. Each respondent rated the companies' reputation for social responsiveness in managing their external behavior along a 5-point Likert-type scale ranging from 1 = poor to 5 = excellent. The general measure of corporate social performance was highly correlated with seven other, more precise components of corporate social performance (r = .45–.81) and highly correlated with the average of those component dimensions of social performance (r = .74). The interrater reliability within each of the stakeholder groups was very high (r = .99). The responsiveness ratings of the six forest products companies were: Pacific Timber, 4.26; American Forests, 3.32; U.S. Paper, 3.30; New York Paper, 3.21; Central Paper, 3.13; and Northwest Forest, 3.08.[1] A fuller discussion of these companies and of such stakeholder ratings of company social performance appears elsewhere (Sonnenfeld, 1981a: 70, 231).

With only one stakeholder group surveyed, the scoring for corporate social performance in the insurance industry was more straightforward. In the survey, insurance commissioners picked, from a list of the 25 largest insurance corporations, the firms they considered to be the industry's "five best" and "five worst" social performers. Due to their politically sensitive positions, state insurance commissioners were reluctant to individually rank each of the companies during pilot interviews. As primary industry regulators, the commissioners were more endangered by making precise public judgments than the forest products stakeholders were. A fuller discussion of these companies and of such performance ratings appears elsewhere (Miles, 1987: 72).

The industry's three best social performers were invited to, and did, participate in the study. In addition, we contacted the industry's five worst

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[1] The names of all companies have been disguised to preserve confidentiality.

TABLE 1
Summary of Data Collection

Respondents	Topic	Field Interviews		Questionnaire Survey	
		Organizations	Individuals	Organizations	Individuals
Top executives, forest products	Public affairs structure	6	90	6	141
Stakeholders, forest products special interest groups	External social performance ratings	10	33	10	75
Top executives, insurance	Public affairs structure	7	73	7	73
Stakeholders, state insurance commissioners	External social performance ratings	12	12	34	34

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social performers, and two of them agreed to participate. Finally, two companies from a third category of performance, labeled "mixed," were invited to, and did, participate in the study. The mixed companies had received several nominations at *both* extremes of the corporate social performance rating, so we placed them in the middle of the corporate social performance continuum. Since the insurance regulatory system is decentralized, with each state operating relatively autonomously, mixed nominations indicated that these companies performed well in some states and not as well in others. In other words, the mixed companies did not have as consistent a performance record as the best and worst companies.

Social performance scores for the seven insurance companies in our study were computed as follows: the number of commissioners who nominated each company in each category (best five and worst five) was expressed as a percentage of the total number of responding commissioners. The performance ranking for each company was the difference between the percentage of best-five nominations less the percentage of worst-five nominations for that company. For the insurance companies in our study, the rankings were: American, +50 percent; Brown, +43 percent; Century, +37 percent; Delaware, +6 percent; Elite, −10 percent; Freedom, −20 percent; and Georgia, −27 percent.

The executive surveys in both industries focused on three major sets of variables. The first set captured the receptivity of each company to outside information on public affairs. The two dimensions of receptivity were the breadth of the company's contacts with outside stakeholders and the depth of such contacts. Breadth was measured as the number of contacts. For forest products, we measured breadth as the number of outside stakeholder groups with whom executives claimed to be in contact for more than one hour a week. For insurance companies, breadth was the number of outside stakeholder groups with whom company executives claimed to spend at least one day a month. In both industries, the depth of involvement with outside stakeholders was measured as the average length of time generally spent on any particular public affairs issue.

Next, the executive survey measured the degree of integration of public affairs information by asking about the frequency of use of task forces and about how well established steering committees in public affairs were in the organization. Both items were scored on a 5-point Likert scale. There was a moderate positive correlation between these two dimensions of integration ($r = .37$, $p < .001$).

The executive survey measured the influence of public affairs in the following ways: (1) the importance of public affairs in terms of the time and attention of the CEO, (2) the importance of public affairs in terms of the time and attention of the board of directors, and (3) the importance of public affairs for the respondents' career advancement potential. In addition, we computed a total influence score, which was an average of the importance of public affairs in terms of decision making in different parts of the company. Items making up total influence included, in addition to the first three measures, the importance of public affairs in terms of the companies' annual planning process, performance appraisals, career paths, and training programs (α = 0.82 and 0.86 for forest products and insurance, respectively.) Each influence item was rated on a 5-point Likert-type scale ranging from not very important to extremely important. The influence items were well correlated with each other (r = .38–.74; average r = .58, $p < .001$, for each pair).

RESULTS

The data on public affairs structure from the executive surveys were analyzed using a one-way ANOVA. Firms were the units of analysis in this study, and, after aggregating individual executive responses at the company level, we had six cases in forest products and seven in insurance. As we thus had too few degrees of freedom available for multivariate statistical methods, we used an ANOVA to test for differences across companies on the different dimensions of public affairs structure. In addition, we used Spearman rank-difference coefficients of correlation in each industry to explore the relationship between each of our dimensions and social performance. Finally, we examined individual cases that were observed to be exceptions to our hypotheses.

Receptivity

The first hypothesis concerned receptivity to information inflow. Table 2 shows data on this dimension. In the forest products industry, significant differences exist between companies in breadth of information contacts, but not in their depth. Interestingly, the reverse is true in the insurance industry. Insurance companies are similar in the breadth of their outside contacts but differ in their depth. The differences in the structures of the institutional environments of the two industries account for this pattern. Historically, much of the pressure for change in insurance has been channeled through state regulators of the industry and established groups like the National Association of Insurance Commissioners. Because insurance is a relatively complex product, new external groups are slow to emerge, and the breadth of information search patterns tends to get routinized. Thus, the regulated-versus-nonregulated dichotomy between insurance and forest products highlights the differences in the ways public affairs are managed in the two industries. Companies in the forest products industry differ in terms of the breadth of their external networks because many special interest groups confront the industry. In insurance, on the other hand, companies differ in terms of depth, or the amount of time they stay involved with particular issues, because of the high degree to which stakeholders are concentrated in a regulated industry.

Since lack of significant ANOVA results could be either because different firms did not differ in their responses or because respondents from within a firm disagreed, yielding a large within-group variance relative to the between-group variance, we also examined the size of the error term, or

TABLE 2
Results of Analysis of Receptivity

Social Performance Rank	Companies	Breadth of Contacts[a]			Depth of Contacts[b]		
		Total, Including CEO	Public Affairs Executives	Other Executives	Total, Including CEO	Public Affairs Executives	Other Executives
	Forest Products						
1	Pacific Timber	10.52	16.91	6.13	4.00	4.64	3.53
2	American Forests	7.96	11.00	6.00	3.91	4.00	3.86
3	U.S. Paper	11.76	12.92	10.22	4.05	4.27	3.78
4	New York Paper	9.68	11.89	8.63	3.56	3.89	3.39
5	Central Paper	9.37	13.33	7.39	3.78	4.11	3.61
6	Northwest Forests	16.47	16.50	16.40	3.80	4.20	3.00
	Means[c]	10.96	13.76	9.13	3.85	4.18	3.53
	s.d.	2.72	2.22	3.56	0.17	0.24	0.28
	F	2.49*	0.71	2.85*	0.48	0.68	0.37
	df	5,135	5,54	5,74	5,131	5,52	5,73
	Spearman r[d]	−0.31	−0.11	−0.71†	0.60	0.31	0.54
	Insurance						
1	American	4.57	5.00	2.00	4.88	5.00	5.00
2	Brown	4.60	5.14	3.33	3.91	4.00	3.67
3	Century	3.50	5.25	2.20	4.36	4.50	4.20
4	Delaware	4.00	3.67	3.88	3.33	4.00	2.75
5	Elite	5.33	5.50	5.00	4.18	4.57	3.00
6	Freedom	3.71	4.33	3.25	3.33	4.00	2.67
7	Georgia	4.43	6.25	2.00	4.25	4.00	4.33
	Means[c]	4.31	5.02	3.09	4.03	4.30	3.66
	s.d.	0.57	0.77	1.04	0.52	0.37	0.82
	F	0.74	0.76	1.47	2.40*	0.99	1.06
	df	6,58	6,27	6,21	6,63	6,31	6,20
	Spearman r[d]	0.18	−0.32	−0.06	0.40	0.54	0.39

[a] Breadth = number of stakeholder relationships.

[b] Depth = length of time a firm was involved with an issue.

[c] Industry means were computed by averaging company-level responses to avoid a bias toward companies with many respondents.

[d] Spearman rank-difference coefficients of correlation were computed using the procedure defined in Guilford and Fruchter (1973: 283) and Gibbons (1976: 417).

†p <.10 (reported for Spearman test only)

*p <.05

within-group variance. In the insurance industry, the within-group variances for depth and breadth were 1.24 and 4.79, and in forest products variances were 3.84 and 61.85, suggesting that respondents from a single company differed greatly in the breadth of their outside contacts.

In terms of our expectation that companies showing high receptivity to public affairs information would have strong social performance ratings, the negative sign of the Spearman coefficient on breadth of contacts was surprising. Pacific Timber, the industry's best social performer, maintained a breadth of contacts that ranked third in the industry, whereas Northwest Forests, the least socially responsive company, maintained the highest breadth of contacts. This first observation, however, masks an important difference between the differentiation of the roles of public affairs and non–public affairs executives in the two companies. Table 2 also shows that the difference in breadth of contacts between the company's public affairs and other executives is the highest for Pacific Timber and the lowest for Northwest Forests. Such differentiation may enhance a company's receptivity because the differentiation of tasks clarifies executive roles and intensifies a focus on systematic information gathering. Thus, we found that our initial hypothesis regarding receptivity and breadth of contacts needed to be refined to include the differentiation of the roles of public affairs and non–public affairs executives.

Examining our findings on depth of contacts, we found that the Spearman coefficients were more consistent in supporting the hypothesized relationship than they were for breadth. The coefficients were not, however, significant. Examining individual cases corroborated this finding. The three companies with the most depth in forest products also ranked as the top three in responsiveness. American Insurance, the highest social performer in insurance, also had the highest depth of contacts in the industry. Apparently, the high-ranked companies became involved with issues early in the issues' life cycles and stayed involved longer. This finding also suggests that perhaps wider breadth was observed in less responsive companies because they dispersed their resources and fought fires on a wide variety of fronts, without becoming deeply involved and committed to particular stakeholder groups or issues.

Integration

The second hypothesis concerned the level of integration of public affairs information. We studied two specific measures: the frequency with which firms used task forces to coordinate action on public issues and the degree to which they established permanent steering committees to manage action on public issues. Table 3 shows the findings. There were significant differences between companies on integration in both the forest products and insurance industries. In addition, Spearman rank-correlation analysis showed that the association between the frequency of the use of task forces and social performance was significant in the forest products industry. In insurance, use of steering committees and social performance were significantly related. Case-by-case examination further revealed that, in forest products, the best and worst social performers also had the highest and lowest scores, respectively, on both measures. In the insurance industry, two of the top three companies also had the highest scores on use of task forces and steering committees, and Georgia Insurance, the worst social performer, had the lowest score for steering committees and the second lowest score for task forces. However, the case-by-case examination also showed exceptions in the midrange. For example, Century Insurance had a higher score than Brown Insurance on both task-force frequency and steering-committee use, even though Brown ranked higher on social performance.

TABLE 3
Results of Analysis of Integration of Public Affairs

Social Performance Rank	Companies	Task-Force Frequency	Degree of Establishment of Steering Committees
	Forest Products		
1	Pacific Timber	3.78	4.48
2	American Forests	2.95	1.91
3	U.S. Paper	3.14	3.62
4	New York Paper	3.18	3.82
5	Central Paper	2.81	2.00
6	Northwest Forests	2.53	1.93
	Means	3.06	2.96
	s.d.	0.39	1.05
	F	6.55***	21.83***
	df	5,134	5,133
	Spearman r	0.77†	0.37
	Insurance		
1	American	4.13	3.75
2	Brown	3.27	2.50
3	Century	4.00	4.00
4	Delaware	2.81	3.40
5	Elite	3.00	2.91
6	Freedom	3.33	1.83
7	Georgia	3.00	1.38
	Means	3.36	2.82
	s.d.	0.47	0.91
	F	8.38***	3.58**
	df	6,64	6,62
	Spearman r	0.54	0.71†

† $p < .10$
* $p < .05$
** $p < .01$
*** $p < .001$

Internal Influence of Public Affairs

The third hypothesis concerned the internal influence of public affairs. Table 4 shows the findings. Significant differences existed between companies on all four measures of internal influence in both industries.

Results of the Spearman rank-correlation analysis further supported our hypotheses. All coefficients show a positive association between dimensions of internal influence and social performance ranking. Significant coefficients were obtained in forest products with total influence and CEO time and attention and, in insurance, with CEO time and attention. In other words, public affairs issues had higher overall importance in the organizational structure and in the CEO's behavior in those companies that were rated high on social performance.

TABLE 4
Results of Analysis of Internal Influence of Public Affairs

Social Performance Rank	Companies	Total Influence in Company	Time and Attention of CEO	Time and Attention of Board	Personal Career Advancement
	Forest Products				
1	Pacific Timber	2.79	3.81	2.92	3.33
2	American Forests	3.09	4.14	3.10	3.59
3	U.S. Paper	3.07	3.48	3.10	3.81
4	New York Paper	2.72	3.89	3.25	2.68
5	Central Paper	2.59	3.42	2.62	2.96
6	Northwest Forests	2.36	2.80	2.07	3.00
	Means	2.77	3.59	2.84	3.23
	s.d.	0.29	0.42	0.40	0.39
	F	3.40**	4.14**	5.12***	2.52*
	df	5,131	5,132	5,131	5,134
	Spearman *r*	0.83*	0.71†	0.47	0.54
	Insurance				
1	American	3.68	4.88	4.00	4.38
2	Brown	3.54	5.00	3.91	4.00
3	Century	4.00	4.64	4.09	4.55
4	Delaware	2.94	4.00	3.19	3.13
5	Elite	3.80	4.91	4.36	4.40
6	Freedom	3.59	3.67	2.33	3.17
7	Georgia	3.33	4.13	2.88	3.63
	Means	3.55	4.46	3.54	3.89
	s.d.	0.32	0.48	0.69	0.55
	F	3.25**	6.10***	5.84***	4.24**
	df	6,45	6,64	6,64	6,63
	Spearman *r*	0.29	0.57†	0.50	0.39

†$p \leq .10$
*$p < .05$
**$p < .01$
***$p < .001$

Examination of individual cases, however, revealed exceptions. American Insurance, the best social performer, was higher on all influence dimensions than Georgia Insurance, the lowest-ranked social perfomer. But Brown was ranked higher than Century, even though the total influence of its public affairs activities was lower. Similarly, Delaware ranked higher than Elite in its social performance ratings, even though public affairs had a higher total influence score in Elite. Thus, though our hypothesis generally holds, exceptions can be observed in both industries.

Summary of Public Affairs Management

The data presented so far reveal differences between industries and between companies on receptivity, integration, and influence, the three dimensions of our public-affairs-management model. Table 5 summarizes those data. In general, our hypotheses correspond with external ratings of extremes of social performance in both industries. For example, Pacific Timber, the highest-ranked forest products company, had a medium-to-high categorization on all dimensions except the measure of breadth of contacts. The low-medium-high categorization of breadth was affected because, as Table 2 shows, breadth has a somewhat skewed distribution in forest products since Northwest Forests was an outlier with an unusually high score. As a result, Pacific Timber was in the low category on breadth, even though its score was higher than those of three of the six forest product companies in our study.

Similarly, the highest-ranked insurance company had a medium-to-high categorization on all dimensions. At the other end of the scale, Northwest Forest was in the low category on three dimensions, and Georgia Insurance was low on two and medium on four. Thus, the differences in public affairs structure between the highest- and lowest-ranked companies reinforced the relevance of the concept for understanding public affairs performance.

In general, it appears that the *overall* pattern of results in our study provides a stronger confirmation of the relationship between organization structure and social performance than do the patterns for individual hypotheses. Furthermore, the pattern of internal characteristics was blurred when we did case-by-case examination of companies with social performance ratings that were not extreme. In our discussion, therefore, we focus on the companies that were exceptions to our model, and the limitations they bring out in our study.

DISCUSSION

Most research on public affairs management has neglected to employ a theory of internal organizational structure. To address that gap, we suggested a theoretical framework that could be applied across industries. By exploring hypotheses based on receptivity to public affairs information, integration of public affairs information, and the internal influence of public affairs, this study uncovered some fundamental differences and similarities in the ways firms manage public affairs in different industries. First, our data revealed that industry differences affected emphasis on the various components of

TABLE 5
Summary of Dimensions of Public Affairs Management

Companies in Order of Social Performance Rank	Dimensions[a]					
	Receptivity		Integration		Influence	
	Breadth of Contacts	Depth of Involvement	Task Forces	Steering Committees	Influence In Company	Importance to Career
Forest Products						
Pacific Timber	Low	High	High	High	Medium	Medium
American Forests	Low	High	Medium	Low	High	High
U.S. Paper	Medium	High	Medium	High	High	High
New York Paper	Low	Low	Medium	High	Medium	Low
Central Paper	Low	Medium	Low	Low	Low	Low
Northwest Forests	High	Medium	Low	Low	Low	Low
Insurance						
American	Medium	High	High	High	High	High
Brown	Medium	Medium	Medium	Medium	Medium	Medium
Century	Low	Medium	High	High	High	High
Delaware	Low	Low	Low	High	Low	Low
Elite	High	Medium	Low	Medium	High	High
Freedom	Low	Low	Medium	Low	Medium	Low
Georgia	Medium	Medium	Low	Low	Medium	Medium

[a] Companies were categorized as high, medium, and low by computing the range between the highest and lowest values and dividing by three.

public affairs structure. In the forest products industry, which had fragmented interest groups, companies differed in breadth of contacts. In the insurance industry, in which state commissioners were the key outside stakeholders, depth of involvement was a more important differentiating factor than breadth. In both industries, depth of involvement was much more directly associated with high social performance than was breadth of contacts.

Even with industry differences, a common model of public affairs management could be applied across industries. Differences along the internal firm dimensions of receptivity to public affairs information, integration of public affairs information, and internal influence of public affairs information were consistent with external rankings of social performance in both industries, thus suggesting a link between internal firm characteristics and external firm successes in social performance. Prior research in business and society has focused on either internal or external public affairs issues without studying this linkage.

In addition, the results of our study showed that the association of social performance ratings and the individual dimensions of receptivity, integration, and internal influence were not always consistent with our exploratory hypotheses. However, the findings were more consistent with our expectations when we examined the public-affairs-management structure in totality (Table 5). That examination suggested that some companies emphasized one or more of the dimensions of public affairs management but, in the absence of balanced strength along all three dimensions, did not achieve high social performance.

There were, however, several exceptions to our model. Brown Insurance Company was ranked high on social performance even though it was relatively low on the dimensions of integration. Similarly, Delaware Insurance Company was ranked higher than three of the insurance companies on corporate social performance even though it attached relatively low importance to its public affairs activities.

To explain these exceptions, it was necessary to go back to our archival data on the industry. Both Brown and Delaware operated in business segments with relatively low exposure to public affairs issues. As Miles (1982) showed, companies can have different degrees of exposure even though they are part of the same industry; their product and customer mixes make for differences. Both Brown and Delaware were predominantly life and health insurance companies that were not exposed to many of the more volatile public policy issues that confronted the property-casualty segment of the market (Miles & Bhambri, 1982). Thus, in relating corporate social performance to a firm's public affairs structure, it was necessary to go deeper into the structure of the industry itself and the firm's individual exposure to volatile public policy issues.

The importance of business exposure in explaining the public policy pressures on an organization provides for a bridge between a firm's business and product-market strategies and the emphasis that it needs to place on its public-affairs-management structure. This is particularly important in a heterogeneous industry where public policy issues do not tend to be industry-wide but instead have a focused impact on particular segments. An organization could then cope with public policy pressures, up to a point, by choosing an appropriate business-market strategy designed explicitly to minimize its exposure to issues affected by the public interest. In addition, organizations can adapt their public policy postures and be more or less aggressive in dealing with external stakeholders. Thus, an organization with a strong public affairs structure that decides to adopt a confrontational mode would exacerbate problems in its institutional domain.

These connections bring out an important limitation in our study. We analyzed data on the public affairs structures of companies in two very different industries but deemphasized the elements of business and public affairs strategy and hence did not address the variance in social performance ratings that would result from a company's strategic position.

Suggestions for Future Research

Several suggestions for future empirical work follow from our study. They include more explicit research on social performance measurement, on the use of multiple internal data sources, and on longitudinal analysis to study cumulative management decisions that result in various public affairs structures.

Regarding the first suggestion, this study and other recent work (Miles, 1987) have shown that a company's social performance can be usefully measured by using external stakeholder groups. Such measures need to be further refined and combined with archival measures, which can be more objective, to develop comprehensive measures for rating corporate social performance.

Next, our methodology has implications for future research in the area of business and society. Important attempts to further understanding of business-society relations have often relied on a single questionnaire from a single company official to represent an organization's perspective. It is essential, however, to take multiple readings to approximate the collective stance within a company. Given constraints of time and resources, we were able to conduct this kind of multilevel research in only 13 companies (with 214 individual respondents) from two industries. Since our unit of analysis was the company, 13 was a small number of data providers, and that is another limitation of our study. With the need for multiple respondents from each company and the resource constraints most academics operate under, a substantial expansion of sample size at the level of companies and industries would be difficult to achieve. One possible solution may be collaborative research in which each collaborator could focus on selected industries and merge the data with data collected by others to produce a more generalizable set of findings than ours.

The final suggestion has to do with the need to understand the history that has led to the observed differences in public affairs structures. We looked at a group of companies in each industry that were comparable on several important dimensions, like size and resources. In spite of those important similarities, however, the companies had evolved with very different structures and processes for dealing with the same public affairs environment. How and why did that happen? In-depth longitudinal research is called for to explore this interesting question of internal dynamics and causal relationships.

CONCLUSIONS

The companies studied differed greatly in their external social performance ratings and in the various dimensions of public affairs structure measured. In general, stakeholders rated firms with balanced strength in their public affairs structure as more socially responsive. In terms of receptivity to public affairs information, depth of involvement was more consistently associated with high social performance than was breadth of contacts. Integration and internal influence were important in both industries and were positively associated with high social performance. Thus, our conclusions suggest that the role of top management is to interpret appropriately the breadth and depth its institutional environment requires and to implement system-wide balance with integration and internal influence in its companies.

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RESEARCH NOTES

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PATTERNS OF INTEREST AROUND ISSUES: THE ROLE OF UNCERTAINTY AND FEASIBILITY

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Decision makers in organizations are confronted with a variety of issues that activate their attention. Issues are events, developments, or trends that have potential consequence for an organization. Consciously or unconsciously, decision makers become interested in and involved with some issues and ignore others. Their interest is manifested in written or verbal discussions about an issue, collecting information relevant to it, and other concrete behaviors. Interest in an issue represents a type of investment in understanding and potentially acting on that issue. Given that decision makers have only a limited supply of time, energy, and money, interest can only be allocated across a finite issue set. In an organization, such individual investments create patterns across members of wide and diverse interest in some issues and limit the breadth and diversity of interest in others.

Decision makers' interests in issues are consequential for both the processes and the outcomes of decision making. Individuals' interests in issues mark the beginning of commitments that facilitate or block action on an issue (Brunsson, 1982). Once activated, collective interest in an issue serves as a reservoir of knowledge resources that people can draw on to understand and resolve the issue. Finally, decision makers' collective interests in issues can provide a basis for coalition formation so that issue outcomes can be influenced "outside of the formally constructed, legitimate structure" (Stevenson, Pearce, & Porter, 1985: 262).

This research employed a management simulation to explore what kinds of contexts and what types of issues attract decision makers' interests. In particular, it examined empirically how general levels of environmental uncertainty and of the perceived feasibility of resolving an issue are related to the number and diversity of decision makers interested in that issue. The research represents an empirical test of the relationship between issue judgments (feasibility) in particular contexts (certainty-uncertainty) and issue-related behavior (breadth and diversity of issue interest).

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THEORETICAL BACKGROUND

Uncertainty and Issue Interest

Decision makers experience different levels of uncertainty depending on the firm they are employed by (Thompson, 1967), the unit they reside in (Crozier, 1964), the role they inhabit (Bacharach & Lawler, 1981), and the issue they face (Astley, Axelsson, Butler, Hickson, & Wilson, 1982). Levels of uncertainty or individuals' perceptions of whether they can accurately predict conditions around them (Milliken, 1987) in a particular setting affect whether or not decision makers can readily determine a desired course of action. Where high levels of uncertainty exist, there are multiple paths for achieving ends, ends are unknown, and the probabilities that any paths will achieve a desired end are difficult to determine (March & Olsen, 1972).

The presence of uncertainty could affect decision makers' willingness to get involved or express interest in an issue in two very different ways. One line of argument suggests that high levels of uncertainty motivate decision makers to act collectively on an issue. Consistent with this perspective is the notion that collective interest in an issue affords the possibility of pooling resources and collective clout, thus improving the knowledge and influence base for resolving an issue. That is typically the rationale coalition theorists provide in explaining why coalitions of certain sizes and diversity form. Also consistent with this line of reasoning is the idea that, in situations in which uncertainty from either tasks or general environmental conditions is high, many individuals are motivated to join coalitions, as bureaucratic methods of influence are ineffective (Tushman, 1977), conflicting goals may be apparent (Cyert & March, 1963), and precedents and payoffs for knowing how to interpret or resolve an issue alone are few (Gandz & Murray, 1980).

An argument can also be made that supports the opposite relationship between uncertainty and the breath and diversity of issue interest. High levels of certainty may encourage issue interest, as individuals in such contexts can predict that their investment will have some sort of personal payoff. Such logic assumes that in certain contexts, any issue can be more easily understood, prioritized, and resolved than it could be if it were to arise in a more uncertain context (McCall & Kaplan, 1985). Thus, interest in issues in certain contexts is a less personally risky strategy. Compared to the situation in an uncertain context, in a more certain context, the probability of failing to resolve an issue is lower, as individuals have access to more information and can more easily discern relationships between ends and means. According to the second scenario, issue interest will be far greater and more diverse in certain than in uncertain contexts.

That argument leads to a prediction identical with Bacharach and Lawler's (1981) proposition that certain contexts offer greater incentives than uncertain contexts for individuals to join coalitions. Bacharach and Lawler argued that in certain contexts individuals form coalitions to mutually influence outcomes as they do not have a basis for gaining personal power on their own.

Feasibility and Issue Interest

Decision makers' interests in an issue are also related to assessments about the probability of issue resolution, which are captured by the concept of an issue's feasibility (Dutton & Duncan, 1987; Hawley & Nichols, 1982). Those studies have defined perceived feasibility as an individual's assessment of the probability of resolving or being able to take action on an issue. Perceived feasibility is issue-specific, distinguishing it from the more general state of environmental or task uncertainty that characterizes a unit or organizational context. Perceived feasibility depends on levels of perceived understanding and perceived control over the means for resolving an issue (Dutton & Duncan, 1987).

If an issue is perceived as infeasible to resolve, decision makers can have two conflicting responses. On the one hand, a logic similar to the first type described in the preceding section suggests that an issue decision makers perceive as infeasible to resolve—because their control or understanding is inadequate—may motivate them to band together to involve themselves in understanding and working on the issue. By collectively working on the issue, they may give it a higher chance of resolution because of the pooling of talents and influence. Using this logic, infeasible issues should be associated with interest from a broader and more diverse set of decision makers than feasible issues.

The counterpoint to this position is the claim that decision makers are intensely concerned with maintaining their credibility and track records. They therefore may wish to avoid issues that are intractable, wishing instead to associate themselves with feasible issues. Such associations may boost or at least should not damage their credibility. As McCall and Kaplan concluded in their treatise on managerial decision making, "Managers are prone to act more quickly on issues that look easy to solve and procrastinate over tackling issues that are ambiguous" (1985: 44). Thus, according to this perspective, feasible issues should draw the interest of a greater number and a more diverse set of decision makers than infeasible issues.

The arguments developed above reveal two conflicting logics for predicting the conditions and types of issue that activate decision makers' interests. Although both perspectives suggest decision makers act to maximize expected utility from issue involvement, each emphasizes a different source of utility as motivating their interest. This study provided empirical support for one set of relationships over another.

METHODS AND ANALYSIS

Patterns of decision makers' interest in issues were investigated in a six-hour management simulation, developed by the Center for Creative Leadership, referred to as Looking Glass, Inc. (McCall & Lombardo, 1982; Kaplan, Lombardo, & Mazique, 1985). The simulation allowed for control over the issues decision makers faced but placed them in a very realistic setting, giving the research context many of the desirable attributes of a field study (Jenkins, 1986). At the beginning of the simulation, each participant chose 1 of 20 roles ranging from that of plant manager to that of president. Figure 1 diagrams the roles. The roles were organized into three divisions according to the three major product markets served by the company, commercial glass, industrial glass, and advanced glass products.

During the simulation, decision makers in the 20 roles were free to work on whatever issues they wanted. At the end of the simulation, participants recorded decisions made by their division. Although the monetary allocations were inconsequential for affecting any participant's future credibility or career, Looking Glass, Inc. participants have attested to the lifelike pressures experienced in the simulation that made them behave in a manner very similar to how they would have behaved in their real-life jobs (Petre, 1984).

The Issues

A broad range of strategic and tactical issues was built into the simulation—more than 12 issues per division. For this study, two experts selected a set of issues that varied in terms of their perceived feasibility of resolution. They agreed 100 percent on which issues should be studied intensively. The experts selected issues on the basis of data in the simulation training manual, which provided descriptive facts on each issue, and observations about how participants interpreted the issues accumulated from observing more than 20 trials.

Four issues were selected for each division. They ranged from broad, future-oriented issues such as "changes in the markets served by auto glass" (relatively low feasibility), to pressing, operational issues such as the "underutilization of capacity at two plants" (relatively high feasibility). Table 1 briefly describes the set of issues investigated.

Units of Analysis and Participants

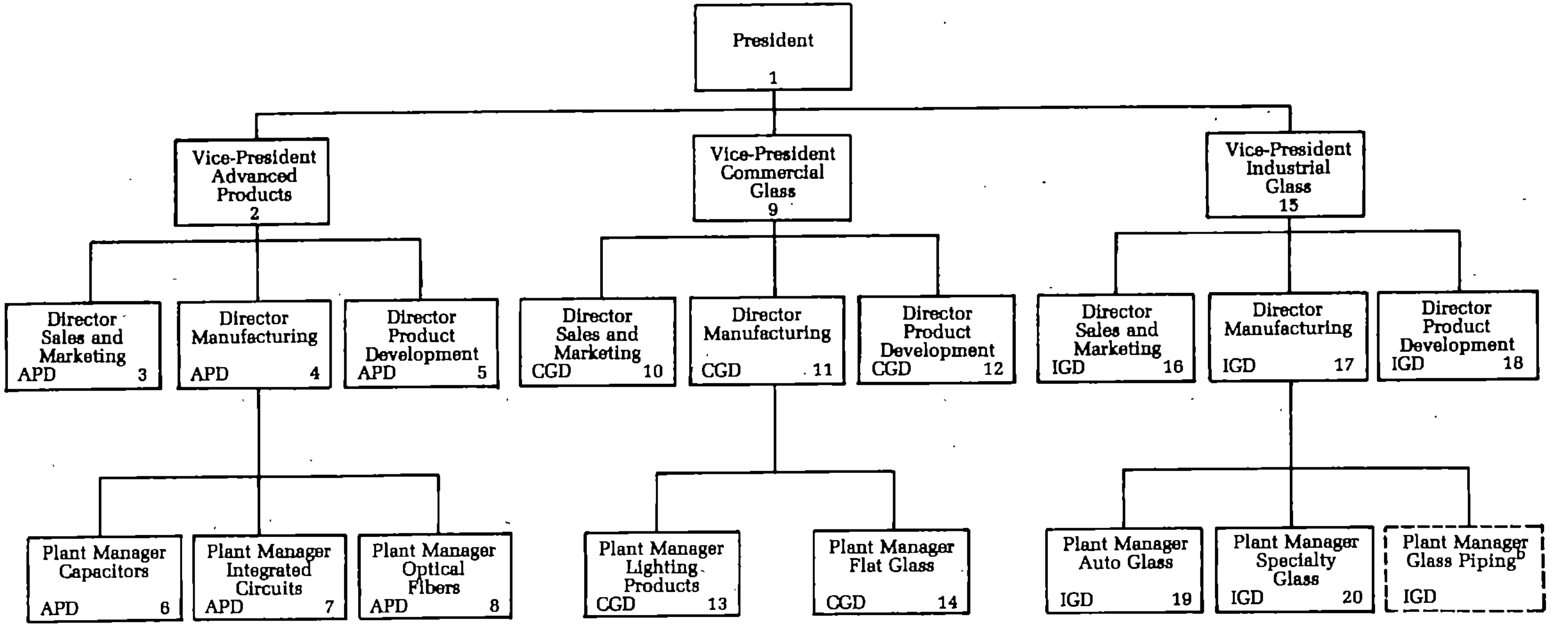
Issues were our chosen units of analysis because we sought to identify judgments (perceptions of feasibility) and behaviors (the breadth and diversity of issue interest) specific to particular issues in particular divisions. The study involved measuring interest breadth and diversity and perceptions of feasibility for the 12 issues (4 in each division). Five groups participated in the simulation. Thus, the analysis was based on 60 issue episodes (4 issues × 3 divisions × 5 replications). Participants were three groups of middle-level managers from a midsize information services firm ($N = 55$) and two classes of students registered in an upper-level business policy course ($N = 38$). A one-way analysis of variance revealed that whether participants were managers or students had no significant effect on judgments of issue feasibility, interest breadth, or diversity, so we combined the manager and student data.

Measures

Following the simulation, each participant completed a series of questionnaires that were used both to give feedback to the participants on such concerns as their style of managing and to compute the issue-level measures.

FIGURE 1
Organizational Chart for the Simulation

LOOKING GLASS, INC.[a]


President 1
Vice-President Advanced Products 2
Vice-President Commercial Glass 9
Vice-President Industrial Glass 15
Director Sales and Marketing APD 3
Director Manufacturing APD 4
Director Product Development APD 5
Director Sales and Marketing CGD 10
Director Manufacturing CGD 11
Director Product Development CGD 12
Director Sales and Marketing IGD 16
Director Manufacturing IGD 17
Director Product Development IGD 18
Plant Manager Capacitors APD 6
Plant Manager Integrated Circuits APD 7
Plant Manager Optical Fibers APD 8
Plant Manager Lighting Products CGD 13
Plant Manager Flat Glass CGD 14
Plant Manager Auto Glass IGD 19
Plant Manager Specialty Glass IGD 20
Plant Manager Glass Piping[b] IGD

[a] APD = advanced products division, CGD = commercial glass division; and IGD = industrial glass division.

[b] In the simulation, this role is a legitimate vacancy to be filled.

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TABLE 1
The 12 Strategic Issues Studied and Their Average Perceived Feasibility[a]

Divisions	Issues
Commercial glass	Energy. The type, amount, and availability of energy will affect future production costs (3.5) Flat glass. Insufficient production capacity in the Flat Glass Plant (3.9) New products. Product development has lost several scientists to other divisions. Current staff lack up-to-date technical training; vision is short-range and noninnovative (4.1) Lighting products. Equipment is causing poor quality in products and customer complaints. Plant also has Occupational and Safety Hazard Administration and Environmental Protection Agency problems (4.2)
Industrial glass	Auto glass. Plant is operating at full capacity and there is natural market growth; a large market exists if truck window and car contracts can be secured (3.5) Energy. Type, amount, and availability of energy used in production is crucial to this division, which has the largest production volume in the country (3.7) Hiring practices. Failure to meet affirmative action guidelines in hiring and promoting women and minorities; ongoing nepotism in hiring practices (3.9) Production capacity. Apparent underutilization of capacity at two plants (4.5)
Advanced products	Integrated circuits. Product has a $4.2 million loss over last two years; successful marketing of a newly developed chip would turn the product around (3.7) Equal employment opportunity policy. Failure to meet guidelines in hiring and promotion of women coupled with an antagonistic posture toward EEO (3.9) Marketing. Market research activities are inadequate for the division's product lines; staff of only three analysts (4.2) Bond telephone. Optical fibers are extremely profitable, but sales are dependent on two main customers; Bond, one of the customers, is demanding a price cut (4.3)

[a] Values for average perceived feasibility are in parentheses. For each division, $N = 20$ issue episodes (4 issues × 5 replications); total $N = 60$ issue episodes (3 divisions × 4 issues × 5 replications).

Issue feasibility. Each participant rated two of the four issues for their division in terms of its perceived feasibility of resolution. Incumbents of each role were asked to make judgments on the two issues that, by design of the simulation, they would have some minimum level of familiarity with. Thus, the most informed individuals in a division made the judgments of feasibility. For all five replications, incumbents of the same roles made judgments on the same issues.

An individual's perception of issue feasibility was computed as the average response to three items: "Was it possible for management to take actions to begin to resolve this issue?" "Was it feasible to attack this issue?" and "Was management able to take action on this issue?" Responses were measured on 5-point Likert scales ranging from "a little or no extent" to "a great extent" ($\alpha = .75$). We computed an issue-level measure of feasibility by taking the mean rating across individuals making judgments on an issue during each simulation. Using James, Demaree, and Wolf's (1984) method for estimating within-group interrater reliability, we found that the reliability of the issue-level measure of feasibility averaged .70.

Issue interest. Each participant was asked to identify which decision makers were interested in a particular issue for the four issues relevant to their division. Interest was assessed by asking participants to circle, from a list of all Looking Glass, Inc. titles, which role incumbents were members of the coalition concerned with an issue. The questionnaire explicitly defined a coalition as "*the individuals who became part of a group interested in an issue.*" All divisional roles were listed, in addition to that of the president. Breadth of issue interest, measured as the number of different roles circled on the role list, could range from 0 to 7 (mean = 2.4, s.d. = 1.6.). Across the five replications, interest in particular issues varied, indicating that issue interest was partially determined by the dynamics of a specific simulation, was not restricted to particular roles for particular simulations, and was not restricted to particular roles for particular issues.

A role incumbent was rated as interested in an issue if at least 50 percent of a division's members indicated that the individual was part of the interested group. The use of that criterion eliminated the possibility that someone could be randomly identified as interested but was not so stringent as to require complete consensus across all division members. We assessed reliability by computing the average level of agreement across division members on whether individuals were judged as interested (67.9% agreement on 140 judgments) or not interested (87.4% agreement on 300 judgments).

Interest diversity. Diversity of issue interest was measured by identifying the two decision makers interested in a particular issue during a particular simulation who were the furthest away from one another in terms of vertical and horizontal distance in the organizational hierarchy. We gave one point for the distance between each of the four levels in the vertical hierarchy and one point for the distance between two departments at a particular horizontal level. Following Bacharach and Lawler's (1981) ideas for measuring ideological distance in a coalition, we computed diversity as the summed vertical and horizontal distance between the two most distant decision makers interested in an issue. The possible range for interest diversity in this study was 0 to 3 (mean= 1.1, s.d. = 0.8).

Uncertainty. The creators of the simulation designed the three divisions to face different levels of environmental uncertainty.

> Each of Looking Glass's three divisions was designed to face a different environment. Conceptually, the environment of the Advanced Products Division is the most uncertain, while that of

> Commercial Glass is most certain. Industrial Glass falls between the two. . . . The major elements used to create this variation in Looking Glass include the nature and diversity of customers and competitors, the sophistication and likelihood of change in technologies, the predictability of future markets, financial stability, etc. (McCall & Lombardo, 1982: 538).

In this study, we used the three divisions to approximate differences in uncertainty, with the Commercial Glass Division representing the most certain context, the Advanced Products Division the least, and the Industrial Glass Division falling between the two extremes.

Although the study did not include direct measures of levels of uncertainty experienced by decision makers in each division, several pieces of data suggest that the levels of uncertainty in the divisions approximated the desired contrasts. For each division, we measured the average number of phone calls made by individuals and the average number of memos written as indirect indications of levels of uncertainty. We expected that the number of phone calls to seek information would be greater in the uncertain context, and that the number of written memos would be greater in the certain context. The rationale for this relationship came from Daft and Lengel's (1984) argument that in uncertain contexts there is a high need for information richness in communication. The pattern of results for the average number of phone calls by division (means = 3.3, 4.2, and 5.3, respectively, for the commercial, industrial, and advanced divisions) and the average number of written memos by division (means = 7.9, 6.8, and 6.3) matched the desired contrasts, but the differences across divisions were not statistically significant. We also computed the average amount of information known by participants in each division, expecting that the level would be highest in commercial glass, the most certain context, and lowest in advanced glass, the least certain context. The level was computed by counting the number of yes responses to a series of 75 questions asking if participants knew specific items of information (e.g., "Did you know that the capacitors market may be shrinking?"). Again, the average scores across the three divisions mirrored the expected patterns (means = 41.9, 42.7, and 43.0% for advanced, industrial, and commercial). However, as in the previous case, differences were not significant (Kruskil-Wallis one-way ANOVA).

Observed Behavior: Validity Checks

Trainers responsible for debriefing the simulation participants observed the behavior of individuals who were interested in the issues. Early in the simulation, a great deal of talking about an issue evidenced the development of issue interest; participants discussed an issue's meaning, its significance, what could be done about it, and so forth. The conversations were sometimes heated and facts and evidence surrounding an issue were often vigorously debated.

Observations on the number of meetings that took place about the issues helped validate the measures of interest breadth and diversity. A greater number of formal and informal meetings took place when issue interest was broad and diverse. One trainer-observer was assigned to each division for a subset of the simulations. Each trainer-observer noted the number of minutes that division members spent in informal and formal meetings discussing the four issues for their division. For the subset of 32 issue-episodes for which data were available, breadth of interest correlated positively and significantly with the number of minutes the issue was discussed in total ($r = .42$, $p < .005$), both in formal meetings ($r = .27$, $p < .05$) and in informal meetings ($r = .46$, $p < .002$).

RESULTS

Analysis of variance and correlation analyses were performed to assess how uncertainty, feasibility, and issue interest were related. Table 1 presents the average ratings of issue feasibility for the 12 issues. As planned, the perceived feasibility of issues varied, although the set was skewed in favor of feasibility. Table 2 presents the means for breadth of issue interest and diversity across the three divisions. As Table 3 shows, one-way ANOVAs revealed that the more certain the context, the greater the breadth and diversity of issue interest.

Table 3 also shows Pearson product-moment correlation coefficients. The overall correlations between issue feasibility and interest breadth ($r = .38$) and interest breadth and diversity ($r = .87$) suggest that the relationship between perceived feasibility and diversity may be an artifact of the correlation between perceived feasibility and interest breadth. Holding interest breadth constant, we examined the partial correlation coefficient between feasibility and diversity, and found that it was not significant (partial $r = -.08$, $p < .26$). In contrast, when we correlated interest breadth and perceived feasibility, controlling for interest diversity, the result remained significant (partial $r = .27$, $p < .02$).

DISCUSSION

This study's results suggest that uncertainty may repel rather than encourage broad and varied interest in issues. Further, issues whose resolution is perceived as feasible also attract wider interest, or a greater number of decision makers, than infeasible issues. Consistent with the view that decision makers are opportunists (Kotter, 1982) and "sure-betters," our findings suggest that people gravitate toward issues more easily when they perceive the issues as having a high probability of resolution and that they take up issues more readily in certain contexts than in uncertain contexts.

The study has implications for researchers considering a simulation methodology for studying decision making. The findings are also suggestive for theories of coalition formation and participation in decision making.

The type of simulation used here has several strengths and drawbacks for examining decision-making processes. Although previous researchers have called for the use of simulations in studies of decision making (e.g., Nees, 1983), very few studies have actually used them (cf. Nees, 1979; Steufert,

TABLE 2
Means and Standard Deviations Across the Three Divisions[a]

	Commercial Glass (Most Certainty)		Industrial Glass (Intermediate Certainty)		Advanced Products (Least Certainty)	
Variables	Means	s.d.	Means	s.d.	Means	s.d.
Issue breadth	3.0	1.4	2.2	1.6	2.0	1.5
Issue diversity	1.6	0.8	0.9	0.8	0.9	0.8
Perceived feasibility	3.8	0.6	4.0	0.6	3.9	0.9

[a] N = 20 for all divisions.

TABLE 3
Results of One-Way ANOVAs, Pearson Product-Moment Correlations, Means, and Standard Deviations for the Three Variables[a]

			Correlations		One-Way ANOVAs with Uncertainty		
Variables	Means	s.d.	1	2	*df*	*F*	*p*
1. Issue breadth	2.4	1.6			2,57	2.55	.08
2. Issue diversity	1.1	0.8	.87*		2,57	3.96	.03
3. Perceived feasibility	3.9	0.7	.38*	.30*	2,57	0.22	.80

[a] N = 60.

*$p < .01$

Clardy, Driver, Karlins, Schroder, & Suefield, 1965). Yet, as this research reveals, a behavioral simulation is useful for studying the processes underlying strategic and operational decisions and for understanding leadership and management processes in general (McCall & Lombardo, 1982; Schneider, 1985). The simulation allowed for unrestricted interaction of multiple decision makers over a wide range of issues, which facilitated measurement and observation at the level of issues as opposed to individuals, units, or organizations. Using the issue as the unit of analysis illuminates how motivations and commitments are organized across decision makers. Although not explicitly measured in this study, the motivations and commitments built around issues have major implications for policy and decision outcomes (Dutton, 1986; Kingdon, 1984).

At the same time, simulations have their limitations. For example, participants may not have had adequate time to develop an interaction history that would allow political processes like coalition side payments (Cyert & March, 1963) to take place. In this study in particular, the issue set included only issues whose resolutions participants perceived as rather feasible. It is impossible to determine if the nature of the issue set or overconfidence among the managers and students was responsible for those feasibility perceptions. Future research should consider the patterns of interests around a broader range of issues. It should also measure the mediating processes through which interest patterns are created, for although this study demonstrated that patterns existed, it did not show why those patterns were observed.

Where great breadth and variety of issue interest is interpreted as evidence of large, diverse coalitions, the findings run counter to assumptions common to political models of organizations. Although numerous theorists have argued that uncertainty creates conditions for extensive coalition formation (Pfeffer, 1981), the results of this study modify those arguments, suggesting that uncertain contexts and infeasibility discourage interest in issues. Although individuals are little motivated to join coalitions under such conditions, those who do are in the position to gain substantial power. Future research needs to clarify the effects of different contexts and issue types on motivation for cooperative action. The results of this study suggest that this relationship is important.

The findings also suggest that theorists need to examine the context in which decision and coalition groups form. Context may enter decision makers' assessments of the expected utility of issue involvement in ways that coalition theorists have not considered (see Murnighan, 1978, for a comprehensive review). The results reported here suggest that both certainty in an issue's context and perceptions of an issue's feasibility relate to patterns and degrees of decision makers' interest in it.

These findings have practical implications for encouraging participation in decision making. In particular, the results suggest that increasing the certainty decision makers experience in a job, unit, or general environment or enhancing perceptions of an issue's feasibility will naturally attract more decision makers to an issue. Where such conditions do not exist, those responsible for encouraging participation may need to add incentives to activate the interest of decision makers in particular issues.

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VOICE AND JUSTIFICATION: THEIR INFLUENCE ON PROCEDURAL FAIRNESS JUDGMENTS

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Stimulated by the pioneering studies of Thibaut and Walker (1975) on different methods of dispute resolution in legal settings, an increasing amount of research has been conducted on issues of procedural justice, which has been defined as the perceived fairness of decision-making processes (see Lind & Tyler, 1988, for a comprehensive review). The primary focus of this research has been on comparing the fairness of different procedures. Such a comparison is found in research on "voice" and "mute" procedures (Folger, 1977). Voice procedures are those that allow people an opportunity to provide inputs to the decision maker, and mute procedures are those that do not provide such an opportunity. One of the consistent findings of such research has been that people perceive voice procedures as fairer than mute procedures (Greenberg & Folger, 1983), even when a decision is unfavorable to them (LaTour, 1978; Lind, Kurtz, Musante, Walker, & Thibaut, 1980).

Recently, researchers have begun to extend findings on procedural justice to organizational phenomena (Greenberg, 1987). For example, voice procedures were perceived as fairer than mute procedures in studies involving participatory decision-making (Greenberg & Folger, 1983), performance appraisal and compensation plans (Folger & Greenberg, 1985), and conflict management (Sheppard, 1984). Furthermore, in each of those domains, people were more likely to support an unfavorable decision when they perceived the decision-making procedure as fair. On the basis of those findings, Greenberg (1987) concluded that procedural justice is the most promising area of organizational justice research, and one that may increase our understanding of different organizational phenomena that have previously not been analyzed in terms of justice. The present research examined whether the findings on voice procedures extend to unfavorable decisions in job recruitment and budget decision-making, two central activities in organizations. In addition, we examined the influence of decision-maker justification on people's judgments of procedural fairness.

Previous research on voice has not explained all the variance in procedural fairness judgments. In addition, such judgments may be based on

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people's causal analysis of a decision maker's motives and intentions in making a decision. For example, in the case of an unfavorable decision, people will search for an explanation of why it occurred (Wong & Weiner, 1981). In that situation, any appearance of impropriety in making the decision on the part of the decision maker will render the procedure suspect, even when a voice procedure was employed (Lind & Lissak, 1985). Apart from their expectations about a procedure, people have expectations that a decision maker will act in an impartial and unbiased manner in making a decision (Leventhal, 1980). Thus, any causal information about the propriety of a decision maker's behavior should provide an additional basis on which people will evaluate procedural fairness.

In organizations, such information can be found in a decision maker's reasons, or *justification*, for a decision (Bies, 1987b). In this study, we examined the influence of a decision maker's justification claiming mitigating circumstances for an unfavorable outcome. Although there are other types of justification (Bies, 1987b), we chose this type because it is used frequently in organizations (Bies, 1987a; Salancik & Meindl, 1984). Providing such a justification may influence procedural fairness judgments because it eliminates a worst-case reading of a decision maker's motives and intentions (Bies, 1987b). For example, providing a justification claiming mitigating circumstances would suggest that the decision maker had no other choice but to behave as he or she did and therefore that any other person would have acted similarly. As a result, there should be little reason to question the fairness of the decision-making process (Lind & Lissak, 1985). Conversely, if the decision maker was silent as to why the unfavorable decision occurred, people might be likely to infer from the absence of discounting evidence (Kelley, 1972) a justification would provide that the actions taken were intentional or deliberate. As a result, people may question the fairness of the decision-making process (Bies & Shapiro, 1987). Following that line of reasoning, we predicted that ratings of procedural fairness would be higher when a justification claiming mitigating circumstances for an unfavorable decision was provided than they would be in an identical situation in which no such justification was provided.

In summary, in the context of an unfavorable decision, we predicted that either a voice procedure or a justification claiming mitigating circumstances would enhance ratings of procedural fairness over those that would be made in an identical situation in which there is a mute procedure or no justification is provided. That is, we predicted main effects for voice and justification. To test our predictions, we employed a multimethod research strategy. First, in a laboratory experiment, we independently varied the procedure and the presence or absence of a justification claiming mitigating circumstances in a job recruitment setting. Second, in a survey, we examined the influence of a voice procedure and a justification claiming mitigating circumstances on procedural fairness judgments about a budget decision.

STUDY ONE

Study one tested our predictions in a laboratory experiment having a 2 × 2 factorial design in which the independent variables were procedure (voice or mute) and justification claiming mitigating circumstances (presence or absence). The dependent variable was procedural fairness.

Methods

Subjects were 51 men and 45 women enrolled in a graduate business school. All volunteered their participation. They were randomly assigned to one of four experimental conditions; there were 24 subjects in each condition.

The focus of this study was an organization's job recruitment decision. We chose this type of decision because there is variation in the types of procedures used, and job candidates are often provided justifications claiming mitigating circumstances when they receive an unfavorable decision. As part of a "study of corporate recruiting practices," we asked the subjects to read "excerpts" from a job candidate's file. The situation involved a business school student who registered a complaint about the recruitment decision-making process at "Southwest Oil." Each subject was asked to make recommendations on the complaint. The senior author developed the materials from interviews with job candidates and business school placement directors for the purposes of this study.

As part of the materials, subjects were told that the candidate had received a rejection letter from Southwest Oil "after an on-campus interview." They then read a description of an interview procedure (mute or voice) and a rejection letter with or without a justification claiming mitigating circumstances. We randomly distributed the order of the manipulations to control for order effects.

In the mute-procedure condition, subjects read the following description of the interview procedure:

> The interview lasted 30 minutes. After a brief introduction, the interviewer spent the entire time describing the company, its history and possible new directions for the company's future. The interviewer did not ask the candidate any questions concerning the resume, nor was the candidate given the opportunity to ask the interviewer any questions about the job and the company. Finally, the interviewer told the candidate that the resume would be used to make a callback recommendation.

In the voice-procedure condition, subjects read the following description of the interview procedure:

> The interview lasted 30 minutes. After a brief introduction by the interviewer, the candidate was allowed to make a 5 minute opening speech to amplify on the resume. After this introductory speech, the interviewer asked the candidate questions about the resume. At the same time, the candidate had an opportunity to ask the interviewer questions about the job and the company. Finally, the interviewer invited the candidate to "point out" any qualifications or background information that had been overlooked during the interview which the interviewer should be aware of before making a callback recommendation.

The justification manipulation occurred in the rejection letter informing the candidate that the company had decided not to extend the job candidate an offer for another round of interviews. In the no-justification condition, the letter did not include a reason for the company's decision.

In the justification condition, subjects read the following explanation in the letter:

> Unfortunately, since we last met, Southwest Oil Company has entered into a depressed economic situation due to the dramatic decline in the barrel price for crude oil. In response to this situation, a hiring freeze has been imposed by top management in my group. As a result, I am writing to inform you that Southwest Oil has decided not to extend you an offer to visit our corporate headquarters for a second round of interviews.

After reading the materials, subjects filled out a questionnaire that included items measuring the dependent variable, procedural fairness, interspersed with filler items dealing with interviewer competence and attractiveness. The purpose of the filler items was to reduce demand characteristics, or to make the hypotheses less transparent. We measured procedural fairness with two questions with endpoints of 1 = very unfair and 7 = very fair. The subjects rated the degree to which they felt that (1) the recruiting procedures at Southwest Oil were fair or unfair and (2) Southwest Oil made recruiting decisions in a way that was fair or unfair to job candidates. As the responses to the two questions were highly correlated ($r = .73$), we summed them.

Manipulation check questions for each independent variable followed. Two questions with 7-point scales assessed the effectiveness of the procedure manipulation: subjects were asked whether the job candidate had had an adequate opportunity to (1) persuade the interviewer of his or her qualifications and (2) ask questions of the interviewer. Two questions with 7-point scales also assessed the effectiveness of the justification manipulation: subjects were asked whether (1) the job candidate had received some explanation for the decision by Southwest Oil and (2) Southwest Oil had attempted to describe the situational factors affecting the decision. The responses to each set of questions were highly correlated ($r = .93$ for procedure and .93 for justification) and thus each set was summed. Upon their completion of these items, the subjects were debriefed.

Results

Manipulation checks. The checks on the validity of the independent variable manipulations indicated that they were successful in establishing the desired perceptions. Specifically, the results confirmed that subjects perceived the difference in the procedures accurately ($F_{1,95} = 124.9$, $p < .0001$). Subjects in the voice-procedure conditions (mean = 11.6) felt the job candidate had a significantly greater opportunity to express a point of view than did subjects in the mute-procedure conditions (mean = 4.7). The results confirmed that the justification information was perceived correctly ($F_{1,95} = 158.4, p < .0001$). Subjects in the justification conditions (mean = 9.6)

TABLE 1
Study One: Mean Ratings of Procedural Fairness[a]

Procedures[b]	**Justification**	**No Justification**
Mute	6.6 (2.9)	4.9 (2.4)
Voice	8.8 (2.8)	5.3 (2.4)

[a] The number of subjects in each cell was 24; $N = 96$. Standard deviations are in parentheses.

[b] Results of two-way ANOVA tests for justification and procedure were significant at $F_{1,92} = 22.46, p < .01, \omega^2 = .17$ and at $F_{1,92} = 5.65, p < .05, \omega^2 = .04$, respectively. There was no significant interaction ($F_{1,92} = 2.31$, n.s.).

perceived the presence of an explanation more often than did the subjects in the no-justification conditions (mean = 3.0). There was no significant interaction between procedure and justification on either set of manipulation check questions.

Procedural fairness judgments. Table 1 reports the results of a 2 × 2 analysis of variance. Subjects in the voice-procedure conditions rated procedural fairness significantly higher (mean = 7.1) than did the subjects in the mute-procedure conditions (mean = 5.8). Subjects in the justification conditions rated procedural fairness significantly higher (mean = 7.7) than those who were in the no-justification conditions (mean = 5.1). Thus, the results of study one support our predictions that the type of procedure and the presence or absence of justification would have independent effects on judgments of procedural fairness.

There is a limitation to the generalizability of the results of this study because it was a laboratory experiment. Although such a methodology is useful in examining causal relationships, additional use of a second method is a preferred research strategy to overcome monomethod bias (Campbell & Fiske, 1959). If another study using a different methodology found a similar pattern of findings, it would contribute to the generalizability of the conclusions of study one. Thus, we conducted a second study, using survey methodology.

STUDY TWO

In this study, we conducted a survey of subordinates' reactions to an unfavorable budget decision. As did the job recruitment situation, budget decision-making can involve variations in the types of procedures used, and there may or may not be a justification by a decision maker for an unfavorable outcome. The purpose of the survey study was to determine whether the laboratory findings would be replicated with a different methodology. In addition, the focus on a budget decision allowed a test of whether the study one findings would generalize to another type of organizational decision. As in study one, we tested the hypothesis that the type of procedure and the presence or absence of a justification claiming mitigating circumstances would have independent effects on procedural fairness judgments.

Methods

The 102 participants in this survey were volunteers from three different groups. They included 45 currently employed people who were enrolled in an evening M.B.A. program, 33 students in a day time M.B.A. program who had at least two years' work experience, and 24 people currently employed in a finance, advertising, or consumer products company. The average age of the participants was 29 years, and their average amount of working experience was 6.5 years. There were 48 men and 54 women.

In this survey, we asked participants to recount a recent and specific time when they made a budget request or proposal to their current boss for more resources, but the boss did not satisfy the resource demands. Participants were asked to provide as much detail as possible about the situation, including the actual dialogue. Such episodes provided the stimulus for the participants to respond to the survey questions.

The procedure involved was measured with one question. On a 7-point scale ranging from 1 (not at all) to 7 (very much so), the participants rated the degree to which they were provided an "opportunity to persuade your boss by fully presenting your position." To test the reliability of the one-item measure, we correlated this ordinal rating with the judgments of two independent raters who coded the recounted experiences for the presence or absence of the opportunity for voice. To do so, the one-item measure was transformed into nominal data by categorizing all ratings lower than 4, the midpoint anchor, "to some degree," as reflecting absence of an opportunity for voice and categorizing those at the midpoint or higher as reflecting the presence of such an opportunity. A chi-square analysis generated a gamma coefficient of .98, suggesting that the item was a reliable measure to use in regression analysis.

Justification claiming mitigating circumstances was measured with two questions. On 7-point scales ranging from 1 (not at all) to 7 (very much so), the participants rated the degree to which they felt that their boss had (1) attempted to provide a justification and (2) claimed the rejection was due to circumstances beyond his or her control. As the two items were highly correlated ($r = .62$), we summed them. In addition, as was done with the procedure variable, two independent raters coded the recounted experiences for the presence or absence of a justification claiming mitigating circumstances, and that information was correlated with the justification ratings transformed into nominal data. A chi-square analysis of these results generated a gamma coefficient of .94, suggesting the two items were a reliable measure to use in regression analysis.

The dependent variable, procedural fairness, was measured with two questions with endpoints of 1 = very unfair and 7 = very fair. The subjects rated the degree to which they felt that (1) the decision-making process was fair or unfair and (2) the boss made the decision in a way that was fair or unfair. As the two items were highly correlated ($r = .92$), we summed them.

Results

Table 2 presents descriptive statistics and the intercorrelation matrix for the variables of interest in this study. Overall, the expected positive associations between the type of procedure and procedural fairness ($r = .45$, $p < .001$) and between the presence or absence of justification and procedural fairness ($r = .37$, $p < .001$) emerged. Examination of the relationship between the two independent variables indicated they were independent of each other ($r = .10$, n.s.).

We used multiple regression analysis to establish the relative influence of the procedure and a justification claiming mitigating circumstances on procedural fairness judgments. Table 3 presents the results of this analysis. Consistent with our predictions, the results indicated that the procedure and the justification each had a significant influence on judgments about procedural fairness. Taken together, both variables explained 30 percent of the variance in procedural fairness judgments. Thus, the results of study two corroborated those of study one.

DISCUSSION

The results of our multimethod research strategy provide converging evidence that people perceive a voice procedure as fairer than a mute procedure in situations involving job recruitment or budget decision-making, even when a decision is unfavorable to them. These results corroborate findings

TABLE 2
Study Two: Descriptive Statistics and Intercorrelations[a]

Variables	Means	s.d.	1	2
1. Procedure	4.3	1.8		
2. Justification	8.2	3.4	.10	
3. Procedural fairness	6.6	3.4	.45**	.37**

[a] N = 102.

**$p < .01$

TABLE 3
Study Two: Results of Multiple Regression Analysis of Procedural Fairness Judgments[a]

Independent Variables	*b*	Standard Error	Beta	*t*
Procedure	.77	.16	.42	4.96***
Justification	.34	.09	.33	3.93***
Adjusted $R^2 = .30$				

[a] N = 102.

***$p < .001$

from research on justice in other organizational situations such as participatory decision-making (Greenberg & Folger, 1983), performance appraisal (Folger & Greenberg, 1985), and conflict management (Sheppard, 1984). Extending previous research to two new organizational situations, these studies provide additional evidence that the procedural justice concept can apply to a variety of organizational situations (Greenberg, 1987).

Another finding was that the presence of a justification claiming mitigating circumstances had an independent effect on procedural fairness judgments. That finding supports our contention that, as does procedure, causal information in a justification for a decision influences fairness judgments. The finding is consistent with the arguments of those who have given an attributional explanation of fairness judgments (Cohen, 1982; Greenberg, 1984). One direction for future research would be to explore the effects of other attributional factors, such as a decision maker's sincerity in providing a justification (Bies, 1987b).

Interestingly, current theories of procedural justice (Leventhal, 1980; Thibaut & Walker, 1975) have ignored the role of justification by a decision maker. That omission is somewhat surprising since in court trials, the primary focus of procedural justice research, judges frequently provide justifications for their decisions. Yet the findings we reported suggest that examining the role of decision-maker justification can increase our understanding of people's reactions to organizational procedures. Thus, the role of justification is a new and important theoretical development in organizational justice (Greenberg, 1987).

The interpretation of the present results should be limited to the type of justification we chose to study. For example, we focused on a justification that claimed mitigating circumstances in the external environment for an unfavorable decision. It may be, however, that other types of justifications generate a different pattern of results. For example, a decision maker's invoking "policy and rules" to justify an unfavorable decision may be perceived by people as more arbitrary, and thus more unfair, than invoking a "drastic change in the economy" as the causal factor. In addition, it may be that people merely expect some explanation for an unfavorable decision (Bies & Moag, 1986)—an expectation that may be influenced by cultural factors—and that the content of the explanation is of little importance (Langer, 1978). Thus, the effects of different justifications and audience expectations are additional directions for future research.

Voice procedures and justifications can also be used for impression management, which represents a new direction for justice research (Bies, 1987b; Greenberg, forthcoming). For example, a voice procedure that creates feelings of procedural fairness may serve as a decision-maker strategy to maintain people's support for an unfavorable decision (Tyler & Caine, 1981). Similarly, a justification may minimize the appearance of impropriety by a decision maker (Bies & Shapiro, 1987), which may provide a necessary cushion of support when bad news occurs (Lind & Tyler, 1988). Researchers might explore the influence on procedural fairness judgments of impression management tactics such as the publicness of a procedure (Greenberg, forthcoming) and the timing of a justification—whether it is given before or after an unfavorable decision (Bies, forthcoming).

The results of the research reported here suggest a need to expand our current conceptualization of procedural justice to include justification by decision makers. That conclusion in no way suggests that the current focus of procedural justice research is invalid; rather, we are suggesting that the scope of its analysis must be broadened to provide a better understanding of procedural fairness judgments in organizations.

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WORKPLACE STRESS AND INDICATORS OF CORONARY-DISEASE RISK

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Survey-based research has contributed to our understanding of the impact of workplace and personal stressors on subjectively experienced stress. Fried, Rowland, and Ferris (1984), however, cautioned that because values for both stressor and stress-reaction variables are typically obtained through subjective self-reports, identified statistical relationships may be as much a function of common methods variance as of true relationships. Given the difficulties with interpreting results obtained through stress surveys, the emergence of organizational studies employing physiological indicators of stress is promising, since those measures may be more reliable and objective than self-reports. If researchers can obtain objective measures of stress as it manifests on the level of physiology, they can evaluate the impact of stressors on employee functioning without fear that relationships are due to common methods variance.

The present study evaluated the effects of perceived job stressors, job dissatisfaction, and recent stressful life events on five separate biochemical indicators of stress and a composite index of stress-related coronary-disease risk derived from a series of longitudinal studies referred to in the medical community as the Framingham studies (Haynes & Feinleib, 1980). The five physiological indicators of stress, obtained through blood or urine specimens or through blood pressure readings, were the ratio of HDL (high density lipid) cholesterol to serum cholesterol and levels of uric acid, triglyceride serum, systolic blood pressure, and diastolic blood pressure.[1] The composite indicator of coronary heart disease, the Framingham index, was estimated from a number of individual variables, including demographic profile, biochemical profile, and health-risk behaviors. A composite index of stress-related coronary-disease risk was used because indexes based on multiple objective predictors are thought to be more reliable and accurate than any single measure alone (McIlroy & Travis, 1981).

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[1] Serum cholesterol is a fat-like substance that collects in arteries, narrowing blood flow and increasing the risk of coronary disease. HDL cholesterol is a beneficial type of cholesterol that cleans the arteries. It reduces the risk of heart disease. Uric acid is a waste product of protein metabolism that increases with stress. Triglyceride serum is a blood fat that has been found to be associated with stress. High levels of systolic and diastolic blood pressure indicate stress-related disorders such as hypertension and coronary disease. Diastolic blood pressure is considered a more stable and better indicator of stress-related disorders than systolic pressure.

This study also evaluated the effects of job stressors, job dissatisfaction, and recent life stress on self-reported psychosomatic complaints. As a dependent measure of perceived stress, psychosomatic distress has been shown to be an outcome of workplace and extra-work stresses in numerous studies (Dohrenwend & Dohrenwend, 1974; Frese, 1985; Parasuraman & Alutto, 1984).

PHYSIOLOGICAL MEASURES USED IN THE ORGANIZATIONAL LITERATURE

Physiologists have assumed that high levels of serum cholesterol, triglyceride serum, uric acid, and blood pressure are objective and reliable indicators of stress (Fried et al., 1984; Haynes & Feinleib, 1980; McIlroy & Travis, 1981). Investigators have also viewed those physiological measures as indicators of stress-related disorders such as coronary disease, hypertension, and peptic ulcers (Asterita, 1985; Ramsey, 1982; Smith, McKinlay, & Thorington, 1987). Organizational researchers have sporadically employed one or more of those biochemical indexes to evaluate the impact of work-role stresses, job dissatisfaction, and recent stressful life changes on experienced stress (Ganster, Mayes, Sime, & Thorp, 1982; Hendrix, Ovalle, & Trexler, 1985) as well as the impact of workplace and personal stresses on the etiology of coronary disease risk (Howard, Cunningham, & Rechnitzer, 1986; Karasek, Baker, Marxer, Ahlbom, & Theorell, 1981). The findings of the studies cited have, however, been weak and inconsistent. In effect, these studies have not suggested as strong a relationship between workplace stresses and physiological indicators of stress as have studies employing subjective dependent measures of stress like psychosomatic distress. Those results are disappointing, given the assumption that physiological measures are more objective and reliable than self-report measures.

The most consistent finding in the literature is that a positive relationship exists between recent stressful life events such as divorce, marriage, and incurring a large debt and serum cholesterol level and blood pressure (Haynes & Feinleib, 1980; Haynes, Levine, & Scotch, 1978). Early studies found serum cholesterol to be associated with job stressors like work overload (Friedman, Rosenman, & Carol, 1957). More recently, however, Howard and colleagues (1986) found that neither job dissatisfaction nor role ambiguity was antecedent to heightened serum cholesterol. Hendrix and coauthors (1985), on the other hand, suggested that the ratio of HDL cholesterol to serum cholesterol was a more sensitive and accurate indicator of manifest stress and a better predictor of coronary heart disease than the level of serum cholesterol alone. A high ratio indicates health. They found the ratio to be lower among men than among women and lower among employees undergoing recent stressful life changes than among others. The HDL to serum cholesterol ratio was not, however, associated with job dissatisfaction or role stresses. In another study, Howard and colleagues (1986) found that job dissatisfaction and role ambiguity led to increased blood pressure and triglyceride serum levels, though no relationship was found for uric acid.

Another study (Fried et al., 1984) has suggested that the inconsistencies in the above findings may be due to the fact that physiological measures are less reliable and accurate than is sometimes assumed. Exogenous and endogenous factors may accidentally influence obtained biochemical and blood pressure levels, making interpretation of results difficult. Proper interpretation is possible only when statistical and procedural controls are employed to manage such contaminating factors (McIlroy & Travis, 1981). According to Fried and colleagues, biochemical measures may vary according to (1) relatively stable factors, such as an individual's genetic makeup, gender, age, weight, and health habits; (2) transitory behaviors prior to the obtaining of blood, urine, and blood pressure measures, such as diet, exercise, and caffeine intake; (3) the circumstances underlying measurement, such as the season of the year and time of day specimens were obtained; and (4) the procedures used to obtain measures (e.g., were procedures uniform for all individuals? was the equipment working properly?). If those sources of variation are accounted for, physiological measures may better reflect the impact of stressors on biochemical indicators of manifest stress and stress-related disorders.

In designing and implementing this study, we took pains to employ uniform and supervised procedures for obtaining blood and urine specimens and blood pressure readings. The study also controlled for individual differences that could influence biochemical levels. Those variables included gender, age, and health-risk behaviors such as excessive smoking and drinking, being overweight, not exercising, not maintaining a healthy diet, and not managing tension through regular relaxation.

METHODS

Data Sources and Procedures

In September 1985, 71 clerical workers and sales assistants from a financial service organization participated as volunteers in a health-risk appraisal sponsored by company management. The few company managers did not participate in the study. The appraisal consisted of a laboratory work-up and survey. Of the 71 employees who provided blood and urine specimens and blood pressure readings, 65 returned a survey assessing levels of perceived job stressors, job dissatisfaction, health-risk behaviors, and psychosomatic distress (a 90 percent response rate). Management initiated the appraisal because it perceived high stress among employees caused by increased work loads. Management was interested in the study to assess whether to invest in a comprehensive wellness program to alleviate the perceived stress. Though it is difficult to assess the relative level of stress experienced by the employees, stressor scores were slightly above those found in other studies (e.g., Jones & DuBois, 1985). The second author, who was contacted by the company to assist with the assessment, coordinated the survey and laboratory work-up. A research technician at the laboratory administered the survey. Employees were advised that a summary report of laboratory findings would be made available to them and that no one but the researchers would see the individual laboratory and survey results.

Measurements

A certified and licensed independent laboratory operating under the direction of a trained pathologist in a large metropolitan area in the upper Midwest obtained the blood and urine specimens and blood pressure readings. To ensure the reliability and accuracy of biochemical measures, the laboratory processed blood and urine control samples with known chemical characteristics simultaneously with the specimens under study. Measures for the specimens under study could be assumed accurate if the control specimens yielded their known chemical levels. The laboratory also controlled for the influence of transitory factors by instructing employees to abide by specific diet and lifestyle rules—no exercise, no smoking, no caffeine, no alcohol use—before testing. All employees confirmed that they obeyed those instructions at the time that specimens and readings were obtained, which was always in the morning. Blood and urine specimens were obtained and blood pressure taken after individuals had been quietly resting and sitting for five minutes. Those cautionary procedures were undertaken because blood pressure, in particular, may be higher when an individual has been standing or walking about immediately before measurement. In total, six physiological measures were used: (1) the ratio of HDL cholesterol to serum cholesterol; (2) triglyceride serum level, which is a measure of actual stress and is also thought to be a good indicator of coronary-disease risk (Hendrix et al., 1985); (3) uric acid level, which measures the activity level of the sympathetic nervous system, which in turn indicates the level of stress in individual physiology (Fried et al; 1984); (4) systolic blood pressure, high levels of which indicate stress and coronary-disease risk; (5) diastolic blood pressure, also indicative of stress and coronary-heart-disease risk; and (6) the Framingham index (Haynes & Feinlib, 1980), which is a composite indicator of coronary-disease risk. The composite indicator of coronary-disease risk was calculated from the logistic equation defined in Smith and colleagues (1987).[2] The equation estimates the probability that a man or woman will die from stress-related coronary disease within the next ten years. The Framingham studies found that death from coronary disease was best predicted by gender, age, systolic blood pressure, serum cholesterol, weight, nicotine intake, and two other indicators: glucose intolerance and electrocardiogram abnormality.

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[2] The sample from which the equation was derived consisted of approximately 10,000 individuals who participated in the 10-year Framingham study. During this period, 1,564 men and 2,040 women died of coronary disease. The logistic regression equation coefficients (βs) for the composite index of coronary disease risk are as follows: for men, constant = −30.80, age = .32, systolic blood pressure = .03, serum cholesterol (mg/100ml) = .04, ECG abnormality (dummy) = .06, glucose intolerance (dummy) = .89, relative weight = .04, cigarettes smoked per day = .73, age × serum cholesterol = .001, and age × cigarettes per day = −.01; for women, constant = −19.58, age = .14, systolic blood pressure = .01, serum cholesterol (mg/100ml) = .02, ECG abnormality (dummy) = 1.86, glucose intolerance (dummy) = 1.83, relative weight = .01, cigarettes smoked per day = 2.17, and age × cigarettes per day = .04.

Glucose is a simple sugar, and intolerance to it is associated with coronary disease. Electrocardiogram abnormality means that there are irregularities in the electrical impulses of an individual's heart, a condition also associated with coronary disease (Smith et al., 1987). Glucose and electrocardiogram readings were obtained by the laboratory along with the other readings.

Independent variables included job stressors, job dissatisfaction, recent stressful life events, age, and gender. Those measures and the dependent measure of psychosomatic distress were obtained through a self-report survey. The copyrighted survey was developed by an insurance company interested in evaluating the effects of stress on employees' well-being. Both authors worked with that company on the survey. We wrote the items after making a complete review of relevant research and existing off-the-shelf surveys and conducting in-depth interviews with the firm's managers and with experts on the stress process. A large item pool was generated and redundant items thrown out. We factor-analyzed the remaining items. Results of the factor analysis suggested that the variables used in this study are nonredundant (cf. Jones & Fay, 1987). All items appear in the Appendix.

Psychosomatic complaints. A 9-item scale was used to measure psychosomatic distress; it asked respondents how often they experienced headaches, muscle fatigue, backaches, chest pains, sleeping problems, and so on. Although test-retest reliabilities could not be obtained for the individuals studied, the two-week test-retest reliability of the scale obtained in a pilot study conducted on employees in a large insurance firm ($N = 418$) was .88 (Jones & DuBois, 1985).

Self-report indicators of health risk. Elevated biochemical levels and blood pressure may be attributed to high body mass (height-weight ratio), poor diet, little exercise, alcohol use, smoking, and inability to relax (Fried et al., 1984). This study employed a 21-item scale that asked respondents to what extent they engaged in behaviors that put their health at risk. We used a single health-risk measure, derived as the sum of the 21 items, since there were not enough degrees of freedom to account for each health-risk behavior separately. The test-retest reliability of this scale in an earlier study was .88 (Jones & DuBois, 1985). For this study, $\alpha = .81$.

Job stressors, job dissatisfaction, and recent life stressors. Perceived job stressors were measured by a 21-item scale that asked respondents about the level of role ambiguity and role overload in their job. Job dissatisfaction was measured by an 17-item scale that asked respondents the degree to which they were satisfied with supervision, peers, pay, advancement, and job duties. Previous test-retest reliabilities for job stress and job dissatisfaction were .91 and .90, respectively (Jones & DuBois, 1985); for this study, $\alpha = .90$ and .89. Personal stressors were measured by a 25-item scale that is a shortened version of the measure used by Haynes and colleagues (1978). Respondents were asked whether, in the previous 12 months, they had experienced such stressors as incurring debt, getting married, changing jobs, becoming ill, and getting divorced ($\alpha = .79$). Test-retest reliability was .89 (Jones & DuBois, 1985). The predictive validity of these three scales has been established against a wide variety of criteria, including industrial accidents, unsafe driving behavior, and illnesses (cf. Jones & Fay, 1987; Jones, Murphy, & Steffy, 1987).

Analysis

Correlational analysis was conducted to evaluate the relationships among independent and dependent variables. We then employed hierarchical multiple regression analysis to evaluate the impact of job stressors, job dissatisfaction, and recent stressful life events on the ratio of HDL cholesterol to serum cholesterol and on levels of uric acid, triglyceride serum, and blood pressure, after controlling for the effects of gender, age, and health-risk behaviors. The advantage of hierarchical regression analysis was that it allowed us to test whether significant changes in incremental R^2 occurred for the stressor variables after the linear effects of the control variables were partialled out (Cohen & Cohen, 1975). Because of the small number of degrees of freedom, we could not control for the intercorrelations among the dependent measures through a multivariate design. We regressed each of the physiological measures and the subjective measures of psychosomatic distress on the independent variables separately. The relationship between the Framingham index of coronary-disease risk and the three stressor variables was evaluated through correlational analysis.

RESULTS

Table 1 provides the means, standard deviations, and correlations among survey and physiological variables. Gender and age were not related to any of the stressor variables or to health-risk behaviors. As is commonly assumed in the medical community, women had higher HDL cholesterol to serum cholesterol ratios than men, indicating less stress and less coronary-disease risk. Women also had lower levels of uric acid, another healthy sign. Older individuals reported less psychosomatic distress and a lower HDL to serum ratio, suggesting they were more predisposed to coronary disease but experienced fewer stress-related symptoms. Compared to other respondents, individuals who engaged in more health-risk behaviors perceived more job stressors; they also reported greater psychosomatic distress and had higher levels of uric acid. Statistically significant correlations were found among the independent measures. Job stress was positively related to job dissatisfaction and stressful life events. Job dissatisfaction and stressful life events were not, however, related at the $p < .05$ level. Statistically significant correlations emerged also among dependent measures. The ratio of HDL cholesterol to serum cholesterol was negatively associated with uric acid and triglyceride serum levels. Uric acid levels and systolic blood pressure were positively correlated. As expected, systolic and diastolic blood pressure were highly correlated. None of the physiological measures were related to psychosomatic distress, suggesting that perceived symptoms of stress may not necessarily be associated with a particular blood-pressure or blood-chemistry profile.

TABLE 1
Means, Standard Deviations, and Zero-Order Correlations[a]

Variables	Means	s.d.	1	2	3	4	5	6	7	8	9	10	11	12
1. Gender[b]	1.46	0.53												
2. Age	37.48	9.51	.03											
3. Health-risk behaviors	63.02	9.62	.02	.08										
4. Job stressors	73.09	8.55	.12	−.27	.36*									
5. Job dissatisfaction	38.84	12.81	.17	−.22	.19	.65**								
6. Stressful life events	32.45	4.53	.16	−.09	.22	.36*	.16							
7. Psychosomatic distress	13.20	3.47	.28	−.32*	.29*	.75**	.45**	.44**						
8. HLD cholesterol/serum cholesterol	37.68	12.63	.38**	−.37*	−.20	−.08	.19	−.02	.05					
9. Uric acid	52.85	13.21	−.50**	.12	.29*	−.10	−.14	.10	−.11	−.58**				
10. Triglyceride serum	104.66	54.92	−.13	.28	.22	.17	−.01	.11	.18	−.61**	.25			
11. Systolic blood pressure	111.63	11.94	−.26	.10	.17	.11	−.11	.14	.05	−.10	.29	.10		
12. Diastolic blood pressure	74.58	8.45	−.19	.19	.25	.16	.00	.14	.06	−.24	.45*	.25	.67**	
13. Coronary-disease risk	0.73	1.77	−.29*	.56**	.37**	.38**	.32*	.06	.33*	−.14	−.13	−.01	.03	.10

[a] $N = 65$.

[b] Women = 2.

* $p < .05$

** $p < .01$

Contrary to expectations, although job stessors, job dissatisfaction, and recent stressful life events were strongly associated with psychosomatic distress, they were not related to any of the independent physiological measures of actual stress. This finding suggests that a moderate to strong relationship exists between the perception of workplace and personal stresses and the subjective experience of stress, but that little relationship exists between those stresses and stress experienced physiologically.

The correlational analysis nevertheless suggested that work stressors and job dissatisfaction are related to coronary-disease risk as measured by the Framingham index. The multiple correlation for the three stressor variables was .59, an encouraging finding that suggests that the composite measures used by medical and public health researchers may be more valid measures of stress than are single physiological indicators. Since the index of coronary-disease risk includes some of the demographic, health-risk, and biochemical variables used in this study, correlations between the composite index and measures of gender, age, serum cholesterol, blood pressure, and smoking habits cannot be interpreted.

Table 2 reports results of the hierarchical multiple regression analyses. Generally, although workplace and personal stressors moderately influenced psychosomatic distress—the only dependent measure obtained through self-reports—the independent variables weakly predicted results for the five physiological measures. Women reported higher levels of psychosomatic distress than did men. Job stress and recent stressful life events positively predicted psychosomatic complaints. As expected, gender, age, and health-risk behaviors had a moderate to strong impact on the physiological measures. Women had higher HDL cholesterol to serum cholesterol ratios than did men. Women also had significantly lower levels of uric acid and systolic blood pressure. Those results concur with medical findings that suggest that men demonstrate more manifest stress and have a greater propensity for coronary heart disease than women. Age was negatively associated with HDL to serum cholesterol and positively associated with triglyceride serum levels, results also consistent with medical findings (Smith et al., 1987). Health-risk behaviors positively predicted uric acid levels and diastolic blood pressure. Once gender, age, and health-risk behaviors were accounted for, job stress, job dissatisfaction, and recent stressful life events had a weak impact on physiologically experienced stress. The only stressor variable related to a physiological indicator of physiologically experienced stress was job stress, which was associated with triglyceride serum levels at the $p < .05$ level.

DISCUSSION

This study's findings suggest a tenuous relationship between survey reports of stresses stemming from the workplace and nonwork-domain and physiological indicators of manifest stress. We obtained these weak findings even after systematically controlling for exogenous and endogenous factors

TABLE 2
Results of Hierarchical Multiple Regression[a]

Independent Variables	Psychosomatic Distress			HDL Cholesterol/ Serum Cholesterol			Triglyceride Serum			Uric Acid			Diastolic Blood Pressure			Systolic Blood Pressure		
	β	Cumulative ΔR^2	ΔR^2	β	Cumulative ΔR^2	ΔR^2	β	Cumulative ΔR^2	ΔR^2	β	Cumulative ΔR^2	ΔR^2	β	Cumulative ΔR^2	ΔR^2	β	Cumulative ΔR^2	ΔR^2
Gender	.177**	.535	.535**	.368**	.132	.132**	−.173	.016	.016	−.516**	.247	.247**	−.212	.044	.044	−.261*	.053	.035*
Age	−.200	.567	.032	−.361*	.253	.121**	.358*	.082	.066*	.096	.255	.008	.181	.076	.032	.102	.063	.010
Health-risk behaviors	.029	.568	.001	−.218	.297	.044	.108	.122	.040	.308**	.334	.079*	.254*	.125	.049*	.188	.095	.032
Job stressors	.649*	.640	.072**	−.069	.302	.005	.270*	.192	.070*	−.209	.378	.044	.052	.126	.001	.154	.117	.022
Job dissatisfaction	−.072	.642	.002	.053	.307	.005	.155	.194	.002	−.142	.397	.019	−.044	.127	.001	−.070	.120	.003
Stressful life events	.181*	.721	.079**	−.142	.326	.019	.054	.213	.019	.156	.419	.022	.096	.135	.008	.197	.158	.038

[a] Betas are standardized; R^2s are adjusted.

* $p < .05$

** $p < .01$

that might bias biochemical measures (cf. Fried et al., 1984). Psychosomatic distress was more strongly related to workplace and personal stressors than were other variables. However, as suggested earlier, since psychosomatic complaints were obtained through self-reports, these findings should be interpreted in light of the problem of common methods variance. Findings also suggest that using only one or two physiological measures of experienced stress may not be adequate. Perhaps, however, composite indicators of stress-related disorders based on multiple predictors may be more fruitful in detecting individual stress. Results for the Framingham index were related to both job stressors and job dissatisfaction. That index is not the only composite measure used by medical researchers to measure coronary-disease risk. There is a similar equation based on an epidemiologic study known as the Risk Factor Update Project (Smith et al., 1987). Obtaining data for such indexes may be logistically complex, but the findings reported here suggest that they may be more valid measures of physiologically experienced stress than are single physiological measures.

In sum, this study did not uncover the expected relationships between perceived stress and a battery of blood chemistry measures. The results nevertheless resemble those of other studies that have also found weak relationships between self-reported stresses and biochemical measures (Fried et al., 1984). Still, we cannot conclude that inadequacies of such measures are responsible for the weak results reported here. Perhaps the self-report measures used in this study were insufficiently reliable or valid. Given the small number of people studied, we may not have had the statistical power to predict biochemical variables. Also, perhaps perceived stress and biochemical indicators are nonsimultaneous—self-reports of stress may precede biochemical changes or, conversely, self-reported stress may lag behind physiologically experienced stress. In any case, the design of this study was such that it could not test for lead-lag effects. Future work should consider these problems. More work is needed to determine what researchers are actually measuring when they employ stress surveys and physiological indicators of stress.

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APPENDIX

Survey Measures

All scales used in this study were from a copyrighted survey, the *Human Factors Inventory*. We used a 5-point response format ranging from 1 = statement definitely false to 5 = statement definitely true (R = reverse-scored).

Psychosomatic distress. (1) Do you experience headaches on the job? (2) Do you feel nervous and jumpy? (3) How often do you experience lower backache and pain? (4) Do you feel fatigued? (5) How often do you experience stomach upset and indigestion? (6) How often in the last few months have you missed work due to colds, fever, and other illnesses? (7) Is it difficult to get up in the mornings? (8) Do you experience chest pains? (9) Has worrying about your job been interfering with your sleep?

Job dissatisfaction. (1) I am very satisfied with my job (R). (2) Management makes a strong effort to understand the opinions of the employees (R). (3) My supervisor is respected (R). (4) I am paid adequately for what I do (R). (5) We have a good team relationship in my department (R). (6) There are too many rules and regulations in this company. (7) I think my work performance is judged fairly by my supervisor (R). (8) There is little room for career advancement. (9) I enjoy my work (R). (10) My job is becoming dull. (11) I feel enthusiastic about my job (R). (12) My supervisor is supportive of my work (R). (13) I feel that my work environment is stimulating (R). (14) When I have a problem, I can go to my supervisor about my concerns (R). (15) I want to work here as long as I can (R). (16) My family life has become more enjoyable since I started working here (R). (17) Coworkers extend help when needed (R).

Job stress. (1) I experience too much pressure on my job. (2) I feel "burned out" on my job. (3) I have overextended myself by taking on too many activities. (4) Working with people in my job is stressful. (5) I seldom feel frustrated on my job (R). (6) I feel overworked. (7) I feel fatigued during the workday. (8) I tend to worry about problems concerning my work. (9) I am hurried or rushed to complete deadlines at work. (10) Pressures of work recently contributed to marital or family difficulties. (11) I have become more frustrated with the users of our services in the last few months. (12) My work responsibilities interfere with my family life. (13) I feel drained after work. (14) The work in my department is well organized (R). (15) I have enough authority to carry out my job responsibilities (R). (16) It is clear what is expected of you at work (R). (17) My superiors make sure that I have clear goals to achieve (R). (18) I feel calm on the job (R). (19) I have lost my efficiency on the job. (20) Lately, I have been getting more upset about my job than before. (21) I feel hopeful about my future with this company (R).

Health-risk behaviors. (1) I try to prevent work stress by exercising and participating in recreational activities. (2) I have maintained good physical health since I started working here. (3) I get a thorough physical examination each year. (4) I get approximately 8 hours sleep at least 4 nights a week. (5) Do you routinely take relaxation breaks during the day? (6) Do you exercise to the point of perspiration at least 3 times a week? (7) Do you stay in top physical condition (including eyesight, hearing, teeth, etc.)? (8) Do you use any stress management technique (e.g., meditation, biofeedback, breathing exercises, deep muscle relaxation, etc.) on a regular basis? (9) Do you drink alcohol on the weekends to relax and unwind? (10) Do you eat a balanced diet? (11) Lately, do you tend to eat, drink, or smoke more than you really should? (12) Are you able to effectively relax and "come down" at the end of a workday? (13) Do you drink alcohol to relax after work? (14) How often do you smoke a pipe and/or cigar? (15) How much beer (12 oz. can or bottles) do you drink during a typical week? (1 = I never drink beer, 2 = 1–2 drinks, 3 = 3–7 drinks, 4 = 8–15 drinks, 5 = over 15 drinks). (16) How much wine (5 oz. glasses) do you drink during a typical week? (1 = I never drink wine, 2 = 1– 2 glasses, 3 = 3–7 glasses, 4 = 8–15 glasses, 5 = over 15 glasses). (17) How much hard liquor (1/2–1 oz. drinks) do you drink during a typical week? (1 = I never drink hard liquor, 2 = 1–2 drinks, 3 = 3–7 drinks, 4 = 8–15 drinks, 5 = over 15 drinks). (18) How many cigarettes do you smoke in a typical day? (1 = I do not smoke, 2 = 1–2 cigarettes a day, 3 = less than 1 pack, 4 = 1–2 packs a day, 5 = more than 2 packs a day). (19) How does your current body weight compare to your ideal body weight? (1 = at ideal, 2 = 1–5 lbs. over, 3 = 6–15 lbs. over, 4 = 16–25 lbs. over, 5 = more than 25 lbs. over). Respondents were provided the commonly used medical tables that assess ideal weight given height and body frame (small, medium, large). Men and women used separate tables.

Recent stressful life events were measured by asking employees to indicate which of the following they had experienced in the last 12 months: (1) legal problems, (2) marriage or remarriage, (3) job promotion, (4) gained a new family member (through birth, adoption, family member moving in, etc.), (5) new job, (6) major change in financial status (a lot better off or a lot worse off), (7) borrowed more than $20,000, (8) spouse began or stopped work, (9) change of residence, (10) spouse died, (11) close family member died, (12) close friend died, (13) major personal injury or illness, (14) serious illness or injury of close family member, (15) serious illness or injury of close friend, (16) divorce or separation, (17) changed work situation (different hours, different duties, etc.), (18) one or more children left home (due to college, marriage, etc.), (19) pregnancy in family, (20) change in number of family arguments, (21) retirement planning, (22) trouble with coworker(s), (23) change in eating, smoking, or drinking habits, (24) trouble with employer, and (25) borrowed less than $20,000.

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GENDER EFFECTS IN DISCIPLINE ARBITRATION: EVIDENCE FROM BRITISH COLUMBIA

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Grievance arbitration is well established in North American labor relations, and arbitrators are given great authority to make what are often very subjective decisions, especially in discipline or discharge grievances. The literature on criminology includes extensive field and experimental research on the effects of defendants' personal characteristics on judges' decisions in the criminal justice system, but there has been very little research on the effects of grievants' personal characteristics on arbitrators' decisions.

Two competing theses about gender effects on decision making, both based on sex-stereotypic assumptions, appear in the criminology literature (Moulds, 1980; Nagel & Hagan, 1983). One is the chivalry-paternalism thesis. The basic premise of this thesis is that men view themselves as protectors of women. Pollak wrote: "One of the outstanding concomitants of the existing inequality between the sexes is chivalry and the general protective attitude of man toward woman. This attitude exists . . . on the part of the officers of the law, who are still largely male in our society. Men hate to accuse women and thus indirectly to send them to their punishment" (1950: 151). In the paternalistic view, a woman is considered to be somewhat like a child—defenseless, not responsible for her actions, and deserving of protection. The implication of the chivalry-paternalism thesis is that men will treat offenses by women with great tolerance. As almost all arbitrators are men (all of them in this study were), the chivalry-paternalism thesis suggests that women will receive preferential treatment from arbitrators.

A counterthesis from the criminology literature is the evil woman thesis (Nagel & Hagan, 1983). The argument here is that women who commit offenses violate sex-stereotypic assumptions about the proper behavior of women. The presumption is that women are incapable of committing wrongdoings. However, if women do commit offenses, they no longer receive protection and preferential treatment. On the contrary, they will be penalized for their inappropriate sex-role behavior as well as for the offenses. The implication is that women will be treated more harshly than men, especially in penalty decisions made after guilt has been adequately established.

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A previous study (Bemmels, 1988a) supported the chivalry-paternalism thesis: women received more favorable treatment than men in 104 discharge arbitrations from Alberta. With other variables controlled, women were twice as likely as men to have their grievance sustained. In grievances that were sustained, women were 2.7 times more likely than men to receive a full reinstatement, and in grievances where a suspension was substituted for discharge, women received suspensions an average 2.1 months shorter than men's.

Another study (Bemmels, 1988b) of 1,812 discharge arbitrations from the United States found partial support for the chivalry-paternalism thesis. Women were 86 percent more likely than men to have their grievances sustained by men arbitrators and 32 percent more likely to receive a full reinstatement. In grievances where a suspension was substituted for discharge, however, women received longer suspensions than men, a result that contradicts the chivalry-paternalism thesis. No differences were found in the treatment of men and women grievants by women arbitrators, and there was no evidence that the preferential treatment of women grievants by men arbitrators has changed over the ten-year span of the sample.

Bigoness and DuBose (1985) conducted an experiment using 80 undergraduate students as arbitrators. They found no differences in the severity of a penalty that could be accounted for by the gender of a grievant or the gender of an arbitrator and no support for the hypothesis that arbitrators of the same gender as a grievant would be more lenient than arbitrators of the opposite gender. However, experimental studies have serious limitations (Osborn & Vicars, 1976), especially those using undergraduates as arbitrators.

The effects of the personal characteristics of defendants on treatment in the criminal justice system has received much attention in the criminology literature. Empirical evidence indicates more favorable treatment of women at each step of the criminal justice system: compared to men, women are less likely to be arrested, are treated more favorably in pretrial decisions such as those concerning bail and detention, are more successful in plea bargaining, are less likely to be convicted, and receive preferential treatment in sentencing (Moulds, 1980; Nagel & Hagan, 1983). The processes of industrial justice are not identical to those of criminal justice, but arbitrators' duties and responsibilities are similar to those of judges.

The two competing theses prohibit a clear theoretical prediction. However, the results of my previous field studies of gender effects in arbitration and most of the evidence from field research on judges' decisions suggest that arbitrators may extend preferential treatment to women. Thus, I hypothesized that arbitrators in discipline grievances will: (1) be more likely to sustain grievances for women than for men, (2) be more likely to award a full rather than a partial exoneration for women, and (3) arbitrate lesser penalties for women than for men in grievances in which the penalty is reduced.

METHODS

Sources of Data

Section 105 of the Labour Code of British Columbia requires arbitrators to file a copy of all decisions with the minister of labour within ten days of their issue. The *Labour Research Bulletin* reports the decisions. A review of all the discipline decisions reported in volumes 5 through 10 (1977 through 1982) provided 633 usable grievances. Some of the arbitrations involved more than one grievant; in this study, each grievant was counted as an observation. I deleted 37 grievances because of incomplete data. All the single arbitrators and all the chairmen of arbitration boards involved in the decisions studied were men, although some of the boards included women.

Variables and Measurement

There were three dependent variables. The first was whether a grievance was sustained or denied. Where a grievance was sustained, the grievant received either a full exoneration, a cash settlement, or a lesser penalty.

The second dependent variable reflected the extent of exoneration for the 371 grievances that were sustained. The variable included two categories: full exoneration, indicating that grievants were completely exonerated from all charges and returned to their former position with no loss of pay or other discipline; and lesser penalty, indicating that grievants received a lesser penalty than that initially imposed by the employer. Grievances that were sustained but for which the arbitrator or arbitrators awarded a cash settlement were excluded. The third dependent variable was the length of suspension (in weeks) imposed by arbitrators for the 152 grievances in which the arbitrators substituted a suspension for the initial discipline.

The primary independent variable was the gender of the grievants. The percentage of woman grievants (13.6 percent) in the cases studied is lower than the 39.7 percent of the employed in British Columbia that were women from 1977 through 1982, and it is also lower than the 30.7 percent of union members that were women. Those differences, which may have implications for the empirical results, are discussed below.

The study measured several control variables that may have influenced the arbitration outcomes and explained gender effects on the dependent variables. I included the initial discipline imposed by the employer and the type of offense to control for differences in severity. Arbitrators are reluctant to sustain discharges for minor offenses, such as attendance and performance problems, unless a grievant has previously been warned that further problems might lead to discharge. However, major offenses, such as insubordination and dishonesty, are generally considered grounds for discharge on the first offense. I also controlled for related and unrelated prior offenses in grievants' disciplinary records, since arbitrators often consider prior offenses in their decisions (Brown & Beatty, 1977: 376-384). I attempted to collect data on the age and seniority of grievants but was unable to obtain sufficient data to include in the empirical analysis.

The grievances were categorized into five major industry groups on the basis of the employer and the union involved and other information in the arbitration reports. The industry in which an incident occurs may influence arbitration outcomes. For example, it might be more difficult for an employer to successfully defend a poor performance evaluation in a service industry or in the public sector than in manufacturing. Women are disproportionately represented in the trade and service industries and in the public sector.

A dummy variable indicating whether arbitrators mentioned mitigating factors was included, since these generally also influence arbitrators' decisions. Common mitigating factors mentioned were inconsistent enforcement by an employer (9.3 percent of grievances), unusual circumstances (7.4 percent), lack of seriousness of the offense (6.8 percent), that the act was unpremeditated or was an isolated incident (3.0 percent), and provocation (1.9 percent). The form of arbitration was included to control for possible differences between single arbitrators and arbitration boards.

Analysis

Table 1 gives descriptive statistics and intercorrelations for all variables. Given the dichotomous nature of the first two of the three dependent variables, I used logit analysis to estimate the models for them. Regression analysis is inappropriate for dummy dependent variables because its use produces heteroscedasticity. Ordinary-least-squares regression analysis was used for the dependent variable "suspension." I analyzed each dependent variable for a gender effect alone and after controlling for the other variables. The two-step procedure allowed evaluation of the stability of gender effects with other factors controlled.

RESULTS

Table 2 presents the logit estimates of gender effects on whether grievances were sustained and full exonerations were granted. Arbitrators generally mentioned mitigating factors only if they ruled for a grievant. Consequently, including mitigating factors with the grievance-sustained dependent variable was almost tautological, so I excluded the former from model 2. The estimates for models 1 and 2 indicate that gender did not have a statistically significant influence on whether a grievance was sustained.

In models 3 and 4, however, a grievant's being a woman had a positive and statistically significant effect on the likelihood of a full exoneration. All the logit models were estimated with the coefficient on the omitted category for each variable constrained to zero. Interpreting the logit coefficients requires that they be multiplied by 2 and that the antilog of this parameter be taken (Haberman, 1978: 294). In model 3, the antilog of $2 \times 0.382 = 2.15$, indicating that a woman's odds of receiving a full exoneration compared to a man's odds were 2.15 to 1. Thus, with the control variables excluded, women were more than twice as likely as men to receive a full exoneration rather than a reduced penalty. When the control variables were included in model

TABLE 1
Frequencies, Percentages, and Intercorrelations for All Variables[a]

Variables	Frequency	Percent	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Dependent variables																			
1. Grievance sustained	390	61.6																	
2. Full exoneration	90	24.3	b																
3. Suspension (in weeks)	8.8^{c}	10.4^{d}	b	b															
Independent variables																			
4. Woman grievant	86	13.6	.05	13**	−.05														
5. Discharge	436	68.9	.14**	−14**	.38**	.06													
6. Suspension	149	23.5	−.12**	.08	−.36**	−.09*	−.83**												
7. Attendance	123	19.4	.00	.07	−.04	−.04	−.01	.02											
8. Insubordination	131	20.7	−.01	−.03	−.07	−.01	−.19**	.20**	−.25**										
9. Dishonesty/theft	55	8.7	−.03	−.04	.18**	.04	.16**	−.13**	−.15**	−.16**									
10. Work performance	120	19.0	.02	.05	.00	.07*	.08*	−.11**	−.24**	−.25**	−.15**								
11. Related offenses	233	36.8	− 14**	−.15**	.06	−.14	.14**	−.13**	.21**	−.03	−.11**	.17**							
12. Unrelated offenses	65	10.3	.07*	.01	.17**	−.04	.16**	−.13**	−.11**	.05	.06	.01	−.26**						
13. Primary industry	160	25.3	−.12**	−.05	.01	−.16**	−.09*	.06	.10**	.02	−.04	−.14**	.11**	−.06					
14. Manufacturing	161	25.4	−.08*	.06	.11	−.16**	−.05	.09*	.05	−.04	.00	−.06	−.04	.04	−.34**				
15. Trade	34	5.4	.00	.09*	−.01	.07*	.01	.00	−.05	.00	.08*	.05	−.02	.06	−.14**	−.14**			
16. Service	162	25.6	.15**	−.07	−.07	.04	.12**	−.10**	−.03	.01	.03	.10**	.00	.04	−.34**	−.34**	−.14**		
17. Mitigating factors	340	53.7	.67**	−.03	−.04	.04	.07*	.02	.04	.04	−.03	.01	−.12**	.04	−.04	−.08*	−.05	.14**	
18. Arbitration board	244	38.5	.14**	−.05	.00	.19**	.11**	−.12**	.06	.06	.08*	.06	−.09*	.01	−.34**	.03	.07*	.27**	.05

[a] $N = 633$ for all variables except full exoneration, $N = 371$, and suspension, $N = 152$. All variables except suspension are categorical. The omitted categories are: grievance denied, lesser penalty, male grievant, other discipline, other offenses, no record, public sector, no mitigating factors, and single arbitrator.

[b] Correlation coefficient cannot be computed.

[c] Mean.

[d] Standard deviation.

*$p < .05$

**$p < .01$

TABLE 2
Logit Analysis of Arbitrators' Decisions[a]

	Grievance Sustained		Full Exoneration	
Variables[b]	**Model 1**	**Model 2**	**Model 3**	**Model 4**
Constant	.291**	.058	−.441**	−.125
Woman grievent	.147	−.062	.382**	.291**
Initial discipline				
Discharge		.256*		−.358**
Suspension		−.010		−.185
Type of offence				
Attendance		.111		.223†
Insubordination		−.023		.068
Dishonesty/theft		−.213†		−.002
Work performance		−.017		.167
Disciplinary record				
Related offenses		−.302**		−.237**
Unrelated offenses		−.057		.060
Industry				
Primary		−.159†		−.038
Manufacturing		−.162†		.104
Trade		−.131		.239
Service		.136		−.081
Mitigating factors				−.061
Arbitration board		.143*		−.131

[a] Grievance sustained, $N = 633$; full exoneration, $N = 371$.

[b] All variables are categorical. The omitted categories are: male grievant, other discipline, other offenses, no record, public sector, no mitigating factors, and single arbitrator.

†$p < .10$
*$p < .05$
**$p < .01$

4, the estimated gender effect declined, and women were estimated to be 80 percent (antilog of 2 × .291 = 1.79) more likely than men to receive a full exoneration.

The regression results with length of suspension as the dependent variable are not reported. The gender effect was not statistically significant with or without the control variables included.

DISCUSSION

The empirical results are mixed. A statistically significant gender effect emerged for one of the three dependent variables. After controlling for other factors, I found that the odds of women receiving a full exoneration rather than a lesser penalty were 80 percent higher than the odds for men. That result is consistent with the results from earlier studies (Bemmels, 1988a, b) of discharge arbitration and is also consistent with the results of empirical studies of gender effects on the decisions of judges. However, the insignificant results on the other two dependent variables are inconsistent with those of Bemmels (1988a, b).

The significant gender effect may indicate a favorable bias toward women among arbitrators. However, the analysis implicitly assumes that the men and women had, on the average, equally valid grievances, and therefore, an equal probability of prevailing on the basis of the merits of their grievances. For several reasons (Bemmels, 1988a), those assumptions may not be valid.

The women may, on the average, have had stronger grievances than the men because there was discrimination against women by employers in discipline decisions or preferential treatment in a grievance process before it reached arbitration. The evidence on discrimination is mixed (Beyer & Trice, 1984; Nieva & Gutek, 1980; Podsakoff, 1982). Furthermore, if such discrimination were prevalent, a disproportionately high number of cases involving women would be likely, rather than the low proportions found in this study. Dalton and Todor (1985) found that women were more likely than men to prevail in grievance procedures, but other studies (Larwood, Rand, & Hovanessian, 1979; Rosen & Jerdee, 1975) have found that women received less favorable treatment of their grievances than men. Furthermore, the effects of these potential sources of differential merit on grievances at arbitration could cancel each other out.

Finally, women may have stronger grievances than men if men have more of their grievances taken to arbitration. Knight (1987) presented evidence from British Columbia that men make more tactical use of the duty of fair representation, in effect threatening legal action if a union fails to proceed with a grievance to arbitration. Union officials could also discriminate against women in deciding which grievances to take to arbitration. However, many union officials believe that every discharge, meritorious or not, should be arbitrated, a practice that would negate the potential sources of differential merit.

CONCLUSIONS

This study presented evidence that, in some respects, arbitrators treated women more leniently than men in discipline grievances. That finding could have implications for management, unions, and the institution of grievance arbitration. For example, unions might attempt a strategy of having test cases that go to arbitration to establish a precedent for future grievances be cases involving women. Management would, of course, want test cases involving men. The distinction could ultimately affect which grievances go to arbitration.

The viable options to remedy gender biases in arbitration are not entirely clear. Training for arbitrators to help them become aware of and overcome the subliminal effects of stereotyping on their decisions might be helpful. A simple awareness of the problem might be sufficient, or more drastic actions such as statutory limitations on arbitrators' discretion might be in order. Further experimental study probing the sources of gender effects in arbitrators' decisions will be helpful in identifying the appropriate policy implications of the present results.

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PUBLICATION IN LEADING MANAGEMENT JOURNALS AS A MEASURE OF INSTITUTIONAL RESEARCH PRODUCTIVITY

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During the past two decades, increasing attention has been given to faculty and institutional research productivity in higher education. One line of research focuses on the effect that journal publications have on the compensation and careers of faculty members (Broad, 1981; Brown, 1983; Cole & Cole, 1967; Diamond, 1985; Hamermesh, Johnson, & Weisbrod, 1982; Hansen, Weisbrod, & Strauss, 1978; Katz, 1973; Long; 1978; McDowell & Amacher, 1986; Medoff & Abraham, 1980; Reskin, 1977; Siegfried & White, 1973; Tuckman & Leahey, 1975). A second line of research deals with the prestige ratings of the leading scholarly and professional journals (Coe & Weinstock, 1969, 1984; Hawkins, Ritter, & Walter, 1973; Liebowitz & Palmer, 1984; Lindsey, 1980; Moore, 1972; Sharplin & Mabry, 1985; Vocino & Elliott, 1984). A third line of research analyzes the productivity of universities or academic departments (Andrews & McKenzie, 1978; Bazley & Nikolai, 1975; Benjamin & Brenner, 1974; Henry & Burch, 1974; Hogan, 1986; Laband, 1985; Long, 1978; McCormick & Bernick, 1982; Reskin, 1977; Windal, 1981). This study combined the second and third lines of research and assessed institutional contributions to leading management journals.

The growing emphasis on journal publications in management has led to a proliferation of publication outlets to which faculty members can choose to submit their research (Ney, 1983). Cabell's (1985) *Directory* lists over 230 business journals, and there are highly regarded journals in economics, psychology, sociology, and law that also represent attractive publication outlets. As the number of business, economics, and accounting journals has increased, efforts have been made to determine which publications are the most prestigious. Coe and Weinstock (1969) established a list of 15 of the most highly regarded management journals.[1] In a recent survey of management department chairpersons (Coe & Weinstock, 1984), they added 7 journals to the list (Table 1). Sharplin and Mabry developed a weighted measure of the 10 leading management publications based on "citation impact efficiency," which they defined as "the number of citations per 10,000 words published annually in either the *Administrative Science Quarterly* or the

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[1] The *Systems and Procedures Journal* was later retitled the *Journal of Systems Management*. It is counted as a single journal in this study.

Academy of Management Journal" (1985: 141). All but three of the publications from Sharplin and Mabry appear in Coe and Weinstock's list (Table 1). Most of the journals in the two lists have existed for a number of years and use multiple referees and editorial reviews. Nearly all have acceptance rates of less than 25 percent (Cabell, 1985; Coe & Weinstock, 1984), and several have editorial offices located at prestigious universities.

A concern with the two lists is that they commingle journals that serve different audiences or markets. Windal (1981) and Bublitz and Kee (1984) took that problem into account when they categorized accounting journals by readership, distinguishing between those with academic and those with practitioner audiences.

This study attempted to answer the following questions: (1) What dimensions underlie journal rankings? Do journals serve audiences that are sufficiently different to warrant establishing separate lists or rankings? (2) How do institutions of higher learning rank for the 1980–85 period in terms of their research productivity in the leading management journals? Are there

TABLE 1
Two Lists of Publications

Coe and Weinstock (1984)	**Sharplin and Mabry (1985)**
Journal of Operations Management	
Management Science	same
Academy of Management Review	same
Decision Sciences	
California Management Review	same
Long Range Planning	
Journal of Applied Psychology	
Academy of Management Journal	same
Operations Research	
Journal of Systems Management	
Administrative Science Quarterly	same
Organizational Behavior and Human Performance	same
Harvard Business Review	same
Supervisory Management	
Industrial and Labor Relations Review	
Personnel	
Sloan Management Review	
Personnel Psychology	
Organizational Dynamics	
Journal of Business	
Administrative Management	
Journal of Purchasing and Materials Management	
	Human Relations
	Journal of Management Studies
	Academy of Management Proceedings

significant variations in institutional rankings for different categories of journals? (3) Are there variations in rankings due to faculty size? (4) How stable are institutional rankings of research productivity? (5) Do scholars from institutions with doctoral programs focus on different categories of management journals than those from institutions without doctoral programs? (6) How do these measures compare with each other and with other criterion measures? (7) Do faculty members of institutions at which journals are located publish significantly high percentages of articles in those journals (McDowell & Amacher, 1986)?

METHODS

The institutional affiliations of the authors who published in the 25 publications that make up the combined set of the Coe and Weinstock (1984) and Sharplin and Mabry (1985) lists were tabulated for a six-year period (1980–85).[2] Over that period, scholars from 330 institutions made contributions to these leading management journals. For each article published from 1980 through the end of 1985, we assigned a point or a fraction of a point to the author's institution, using the following scheme. Each article had a value of 1.0.[3] The value of an article with multiple authors was divided by the number of authors listed on the publication. Thus, an author from university A would receive an institutional weight of 0.5, and his or her coauthor at university B would also receive 0.5. No weighting distinction was made between senior authors and their coauthors. An institution received credit for an article based solely on the affiliation listed on the publication, and we assumed that authors listed the institution to which they had primary allegiance.[4] We then summed the points to obtain the productivity of each of the 330 institutions for the six-year period.

Productivity may be partly a function of the size of a faculty. To examine this possibility, we obtained data on faculty size for business schools from the American Assembly of Collegiate Schools of Business (AACSB)[5] and calculated annual mean business-school faculty size. With a few exceptions, this measure was stable from one year to the next.

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[2] Because we wished to explore the dimensionality of the measure, the weights from the Sharplin and Mabry list were not used in the dimensionality analysis. We reintroduced the weights for the Sharplin and Mabry impact measure for the institutional rankings. Weights were not used for the Coe and Weinstock list since those authors did not have weights for their entire list.

[3] No credit was given for book reviews or letters to the editor.

[4] Some articles were undoubtedly written at one institution, yet credited to another. This commonly occurs when an author holds a visiting appointment or has made a job commitment to another school. Because of the lengthy time lags that frequently arise between the acceptance of a manuscript and its publication, an author may list the institutional affiliation of a future employer. We assumed that, over a six-year time period with more than 200 schools, no consistent bias exists because of these phenomena (Long & McGinnis, 1982).

[5] The AACSB only had size data for 1982, 1983, 1984, and 1985. Since some schools did not report faculty size data to the AACSB, the size analysis is based upon 276 institutions. The faculty size data represent the number of full-time business school faculty members as reported by the schools to AACSB. We wish to thank Richard T. Wines and Mary J. Gust of the AACSB for their assistance with the faculty size data.

Ideally, productivity and size would be assessed in terms of publications by members of a management faculty only and the size of the management faculty only. But those two sets of data are very difficult to obtain. The size of its management department is partly a function of an institution's organizational structure. Similarly, it is difficult to tell from the institutional affiliations listed in the journals which publications are by management faculty members. Therefore, we used institutional productivity in the management journals and the size of an institution's business school.

RESULTS

Factor Structure

The first step in the analysis was to explore the dimensionality of the Coe and Weinstock (1984) list with a principal components analysis of the institutional publications in the journals studied. Since the list contains journals whose chief audiences are academics and journals whose chief audiences are practitioners, the dimensionality test examined the concept of using separate measures for the two types of journals, as suggested by Windal (1981) and by Bublitz and Kee (1984).

Eigenvalues greater than or equal to 1.0 were 8.6, 2.4, 1.7, 1.2, and 1.0 for the first five factors. However, a scree test (Cattell, 1966) supported the retention of only the first two principal components. Table 2 shows the factor loadings on those components, based on orthogonal varimax rotation.

Fourteen journals had loadings greater than 0.4 on the first factor. According to Cabell (1985), 10 of the 14 journals with loadings greater than 0.4 on the first factor were academically oriented. It appears that the first factor is primarily a clustering of institutional representatives publishing in academically oriented journals. Four of the eight journals with loadings greater than 0.4 on the second factor were practitioner-oriented. Thus, the second factor is not as easy to interpret as the first.

The dimensionality of the Sharplin and Mabry measure was explored in a similar manner. Eigenvalues greater than or equal to 1.0 were 4.7, 1.3, and 1.1 for the first three factors. On the basis of a scree test, we retained only the first two components. Five of the six journals with loadings greater than 0.4 on the first factor were academically oriented. For the second factor, four of the four publications with loadings greater than 0.4 were academically oriented. Partly because there are only two practitioner-oriented journals in this list, both factors appear to consist of institutional faculty publishing in academically oriented journals.

Windal (1981) and Bublitz and Kee (1984) argued for separating measures of research productivity by the two types of journal. The factor analysis shown in Table 2 lent some support to the concept that separate publication patterns existed. Using Cabell's (1985) description of their primary target audiences, we derived a list of 15 academically oriented journals from the

TABLE 2
Factor Loadings for Coe and Weinstock's List

Journals	Factor 1[a]	Factor 2[a]
Journal of Operations Management (academic)	.48	.22
Management Science (academic)	.45	.66
Academy of Management Review (academic)	.62	.33
Decision Sciences (academic)	.86	.24
California Management Review (practitioner)	.43	.52
Long Range Planning (practitioner)	.84	.09
Journal of Applied Psychology (academic)	.90	.14
Academy of Management Journal (academic)	.78	.28
Operations Research (academic)	.82	.32
Journal of Systems Management (practitioner)	.75	.00
Administrative Science Quarterly (academic)	.69	.49
Organizational Behavior and Human Performance (academic)	.82	.27
Harvard Business Review (practitioner)	−.07	.69
Supervisory Management (practitioner)	.31	−.08
Industrial and Labor Relations Review (academic)	.40	.63
Personnel (practitioner)	.51	.15
Sloan Management Review (practitioner)	.02	.74
Personnel Psychology (academic)	.35	.09
Organizational Dynamics (practitioner)	.05	.88
Journal of Business (academic)	.18	.59
Administrative Management (practitioner)	.06	.19
Journal of Purchasing and Materials Management (practitioner)	.28	−.03

[a] The eigenvalues for the first and second factors are 8.6 and 2.4, which respectively accounted for 39 and 11 percent of the variance.

set of publications in Coe and Weinstock (1984) and in Sharplin and Mabry (1985). We based another list, with ten practitioner journals, on Cabell's (1985) description. The two lists, along with the original lists by Coe and Weinstock and by Sharplin and Mabry, formed the basis of the four measures used for assessing institutional research output in this study.

Faculty Size

Correlations of the size of the faculty of a business school with research productivity for the four lists were all significant at $p < .01$ for the 276 institutions reporting faculty size. The correlations were 0.48 for the Coe and Weinstock list, 0.39 for the Sharplin and Mabry list, 0.42 for the academic list, and 0.38 for the practitioner list. Since those correlations are significant, both total institutional productivity data and per capita productivity data are reported, and both are worthy of investigation.

Rankings

Table 3 contains rankings of the top 50 institutions based on total institutional publications in the Coe and Weinstock list for the six-year period. The Appendix contains rankings of the top 50 institutions not in the top 50 of the

TABLE 3

Rankings of Top 50 Schools for Four Lists of Journals [a,b]

	Coe and Weinstock		Sharplin and Mabry		Academic		Practitioner	
Schools	Total	Per Capita	Total	Per Capita	Total	Per Capita	Total	Per Capita
Harvard University	1	6	3	22	23	68	1	1
Columbia University	2	5	2	2	1	2	11	13
Massachusetts Institute of Technology	3	2	12	7	10	7	3	2
University of California, Berkeley	4	4	6	4	14	8	2	3
Stanford University	5	3	1	1	6	3	6	6
New York University	6	53	13	45	3	49	14	73
Ohio State University	7	26	9	15	2	14	66	114
Indiana University at Bloomington	8	44	15	38	11	43	17	54
Texas A&M University	9	29	4	12	4	23	10	23
University of Illinois	10	34	10	17	9	29	19*	48
University of Pennsylvania	11	50	5	20	5	45	7	33
Pennsylvania State University	12	33	11	19	7	27	16	39
University of Houston	13	16	27	29	8	11	35	53
University of Michigan at Ann Arbor	14	22	18	25	13	16	15	20
University of Washington	15	14	16	18	16	20	33	46
University of Southern California	16	N.A.	17	N.A.	21	N.A.	8	N.A.
Cornell University	17	1	24	3	15	1	104	57
Purdue University	18	12	37	41	18	12	85	88
University of Wisconsin-Madison	19	23	23	24	17	18	47	63
Virginia Polytechnic Institute and State University	20	49	20	35	12	32	87	139
University of California, Los Angeles	21	25	14	14	31	39	12	11
University of Minnesota at Minneapolis/St. Paul	22	39	8	11	20	35	39*	70
Northwestern University	23	38	7	9	24	37	38	65
University of Maryland	24	11	31	23	22	13	24	14
Michigan State University	25	63	22	51	19	53	48*	111
Boston University	26	N.A.	34	N.A.	55	N.A.	5	N.A.
Arizona State University	27	78	65	114	61	112	4	24
University of South Carolina	28	61	30	55	26	56	32	76
Carnegie-Mellon University	29	13	28	16	28	15	77*	64
University of Chicago	30	47	89	99	29	41	121*	159
Georgia Institute of Technology	31	7	58	46	25	5	135*	117
University of Georgia	32	57	45	61	27	50	54	90
University of North Carolina at Chapel Hill	33	35	39	40	33	31	84	83
University of Pittsburgh	34	21	52	53	32	21	34	17
University of Cincinnati	35	40	61	62	40	40	63*	61
University of Nebraska at Lincoln	36	36	43	44	42	42	27*	16
University of Missouri, Columbia	37	32	48	42	34	22	45	32

TABLE 3 (continued)

Schools	Coe and Weinstock Total	Coe and Weinstock Per Capita	Sharplin and Mabry Total	Sharplin and Mabry Per Capita	Academic Total	Academic Per Capita	Practitioner Total	Practitioner Per Capita
University of Alabama in Birmingham	38	19	42	27	41	25	18	9
Auburn University	39	56	35	48	37	54	90*	110
University of Illinois, Chicago	40	58	26	28	36	51	77*	101
University of Texas at Austin	41	79	84	117	35	71	100	168
University of Florida	42	67	53	73	38	65	68*	109
University of Santa Clara	43	31	36	21	43	33	48*	27
George Washington University	44	45	131	136	60	61	25*	18
State University of New York at Albany	45	27	25	8	51	36	43	22
Duke University	46	17	55	34	45	19	77*	37
Florida State University	47	68	103	126	64	82	29	44
University of Arizona	48	75	29	52	30	58	174	215
University of Virginia	49	30	111	88	70	52	19*	8
Southern Methodist University	50	46	41	36	63	57	30	19

[a] The total figure refers to the level of total institutional productivity. The per capita figure refers to the level of per capita publications. N.A. means that data on the size of the business school's faculty were not available. For the 48 institutions with faculty size data, the mean business school faculty size is 95.2 and the standard deviation is 40.4. An asterisk indicates a tied rank.

[b] Of these 50 institutions, 46 offered a doctorate through their business school. Auburn University, Southern Methodist University, the State University of New York at Albany, and the University of Santa Clara did not offer a doctorate through their business school (Kurst, 1984).

Coe and Weinstock total list. The rankings are based on numbers of publications in the field of management. Although the large majority of authors were from management departments housed in schools of business, a number of contributors held faculty positions in departments such as psychology, industrial and labor relations, mathematics, and economics. In a few instances, no departmental affiliation was listed in the journal. Therefore, Table 3 designates institutions only. Table 3 shows marked differences in institutional ranks, especially when the list of publications in journals with a focus on practitioners is compared with the other three lists. There are also marked differences between the total publications and per capita publication rankings.

Stability

Reliabilities were calculated in two ways: over the six years and annually. We checked the reliability of the measures over six years by calculating the split-half reliability across the six years. Results for 1980, 1982, and 1984 were summed and compared to the sums of results for the three odd-numbered years. The annual reliability was calculated as the average of the correlations of a year with the adjacent year. It is the average of the five correlations of 1980 and 1981, 1981 and 1982, and so forth. The six-year reliability coefficients are 0.96 for the Coe and Weinstock list, 0.86 for the Sharplin and Mabry list, 0.96 for the academic list, and 0.94 for the practitioner list. The annual reliabilities are 0.92, 0.71, 0.90, and 0.84 for the four measures, respectively. The biannual correlations are lower in all cases, a result supporting the preferability of the six-year data.

Differences Between Schools With and Without Doctoral Programs

Group difference tests were used to examine construct validity (Cronbach & Meehl, 1955). Using the per capita publications measure, we performed a discriminant analysis to see if quantity and type of management research productivity could discriminate between universities with and without doctoral programs in their business school. The results were significant ($p < .01$) and correctly classified 78 percent of the institutions (217 of 276). The coding of the data and the loadings from the discriminant analysis indicated that the higher the productivity on any of the four measures, the higher the chance of an institution's having a doctoral program, and vice versa. Subsequently, we conducted means tests on the four per capita productivity levels between the two groups of universities to examine the magnitude of the differences in per capita publications (Table 4). The data indicate that the schools with doctoral programs score significantly higher than schools without doctoral programs on each of the four measures.

Convergent Validity

All four total productivity measures are significantly associated with each other when productivity data for all 330 schools are correlated (upper right diagonal of Table 5). However, the measure for the group of practitioner journals appears to be measuring something different from the other measures, as it shows the lowest correlations with them. The Spearman correlations of per capita productivity rankings for the top 48 institutions from the Coe and Weinstock total productivity list are contained in the lower left diagonal of

TABLE 4
Results of Means Tests of Per Capita Productivity[a]

	Schools With Doctoral Programs		Schools Without Doctoral Programs		
Lists of Journals	**Means**	**s.d.**	**Means**	**s.d.**	***t***
Coe and Weinstock	0.36	0.31	0.10	0.14	8.03*
Sharplin and Mabry	1.24	1.49	0.27	0.50	6.27*
Academic	0.27	0.26	0.06	0.10	8.03*
Practitioner	0.09	0.11	0.04	0.06	4.06*

[a] Since the standard deviations for the schools with doctoral programs ($n = 100$) were significantly different from the standard deviations for the schools without such programs ($n = 176$) on each of the four measures, Satterthwaite's (1946) modified t-tests were used.

*$p < .01$

Table 5. The coefficient of 0.22 between the measures for the practitioner and academic journals is not significantly different from zero.

Criterion Validity

The *Wall Street Journal* (1985) published the results of a survey in which executives were asked to rank the top 21 M.B.A. programs. Correlations of that ranking with the four per capita productivity measures reported in this article for those 21 business schools were all between –0.01 and 0.29. Those nonsignificant correlations appear to indicate that faculty research productivity and the reputations of M.B.A. programs are independent.

In-House Editorship Effect

McDowell and Amacher (1986) reported an in-house editorship effect for economics journals. They found that members of the faculty at the institution where its editorial office was located published a significantly higher proportion of articles in a journal than scholars affiliated with other institutions. Table 6 contains in-house editorship data for management journals that have editorial offices permanently located at one institution. The in-house editorship effect is particularly strong for the practitioner journals; home faculty members published an average of 22.1 percent of the articles in the three practitioner journals, compared to 5.9 percent for the three academic journals.

DISCUSSION AND CONCLUSIONS

This research demonstrated the effects of separately analyzing journals whose primary audience is practitioners and those whose primary audience is academics. We also took faculty size and in-house editorship into account. The effects of the separation were demonstrated by comparing the total and per capita productivity of the top 50 schools on four lists of journals. Harvard University ranked within the top three on the three total productivity measures, in which practitioner journals, including the *Harvard Business Review*, were counted, but ranked 68th on the per capita academic measure, which did not have practitioner journals. In contrast, Stanford University

TABLE 5
Correlations Among Productivity Measures[a]

Lists of Journals	1	2	3	4
1. Academic		.71	.95	.94
2. Practitioner	.22		.89	.76
3. Coe and Weinstock	.85	.54		.93
4. Sharplin and Mabry	.66	.38	.66	

[a] The upper right diagonal contains the Pearson correlations based on total productivities for all 330 schools. The lower left diagonal contains the Spearman correlations based on the rankings due to per capita productivity of the top 48 schools from the Coe and Weinstock total productivity list. All the correlations are significantly greater than 0 ($p < .01$), except for .22.

TABLE 6
In-House Editorship Effect

Journals	Editorial Offices	Percentage of Articles Published by Home Faculty[a]
California Management Review	University of California, Berkeley	10.1
Administrative Science Quarterly	Cornell University	1.4
Harvard Business Review	Harvard University	33.3
Industrial and Labor Relations Review	Cornell University	7.0
Sloan Management Review	Massachusetts Institute of Technology	12.7
Journal of Business	University of Chicago	9.6

[a] The in-house editorship effect for the *Harvard Business Review* is somewhat higher than the other journals partly because nonfaculty editors and staff at *HBR* also contribute articles.

ranked within the top six on all four measures for both total and per capita productivity. The *Harvard Business Review* had the largest in-house editorship effect; 33.3 percent of its articles over the six-year period 1980–85 were by Harvard University faculty members. Therefore, we recommend that practitioner journals be kept separate from academic journals in future studies of publication and research productivity.

Because of the significant correlations of faculty size with the productivity measures, we also recommend that future studies examine per capita publication rates. A limitation of this research is its treatment of faculty size. The AACSB figures we used represent the sizes of full-time faculties for entire schools of business, not just for departments of management. Thus, this research did not address the fact that mathematics, psychology, sociology, and economics professors who are not in schools of business may be publishing in management journals. Additionally, scholars in schools of industrial relations and in other professional schools may be publishing in management journals. For example, Cornell University ranked 17th and 15th on the total productivity measure for the Coe and Weinstock and academic lists, respectively, but ranked first on both in terms of the per capita measure. It must be noted that Cornell University has a productive industrial and labor relations school whose faculty is not included in the business school faculty. Because organizational structures differ among universities, the approach to faculty size used in this research is less than perfect.

The in-house editorship effect found by McDowell and Amacher (1986) also applies to management journals. Faculty members at institutions housing the permanent editorial offices of leading management journals may have an advantage over those from other institutions because of the former's ease of access to the editor and knowledge of the journal's editorial policies. In-house faculty members may be better able to respond to methodological issues, theoretical orientations, and modes of expression that are peculiar to a particular editor and editorial board. Editors are also more likely to share common views with their home faculty than with potential contributors from elsewhere (McDowell & Amacher, 1986). Thus, it is not surprising that all but one of the leading management journals with permanent editorial offices at a university had an in-house editorship effect. The *Administrative Science Quarterly* was the exception, with less than two percent of its articles published by its home faculty.

The separate academic and practitioner measures used in this study were unweighted. Future studies could weight journals for each measure, perhaps by using separate surveys of academics and practitioners. Exploration of those weights is beyond the scope of this study.

Research output in highly regarded journals is only one attribute of institutional prestige and quality. Scholars from many highly visible and prestigious institutions were among the leading contributors to the journals included here. However, there are other schools with strong academic reputations that were not highly ranked here, perhaps because they have faculties in management that are small relative to the faculties in other disciplines within their business school. Some institutions with research-oriented faculties may publish scholarly books, or focus on the top psychology, sociology, economics, and law journals, which were not included in this study. Additional research could expand the subset of publications to determine if institutional rankings will change significantly.

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APPENDIX

Rankings of Top 50 Schools Not in Coe and Weinstock Total Top 50[a]

	Coe and Weinstock		Sharplin and Mabry		Academic		Practitioner	
Schools	**Total**	**Per Capita**	**Total**	**Per Capita**	**Total**	**Per Capita**	**Total**	**Per Capita**
Rutgers University	72	8	90	32	59	6	61	7
Rice University	82	9	83	26	85	10	135*	47
University of California at Irvine	76	10	44	6	57	4	134	30
California State University at Bakersfield	93	15	134	75	121	63	39*	4
Dartmouth College	69	18	40	10	68	17	90*	25
Vanderbilt University	70	20	32	5	49	9	254	208
Naval Postgraduate School	74	24	72	37	75	26	98	28
University of Rochester	56	28	138	113	54	28	121*	95
State University of New York at Binghamton	91	37	147	101	105	60	53	10
Iowa State University	62	41	50	30	50	30	158	145
University of Texas at Dallas	79	42	62	39	62	24	172	141
University of Oregon	68	43	49	31	53	34	121*	99
Southern Illinois University at Carbondale	55	48	47	43	44	38	52	38
State University of New York at Buffalo	59	51	19	13	47*	44	121*	128
Yale University	61	N.A.	21	N.A.	73	N.A.	46	N.A.
University of Akron	54	59	33	33	39	48	**	**
University of Notre Dame	60	55	46	47	46	47	63*	55
University of Wisconsin at Milwaukee	86	71	51	49	92	77	39*	26
University of Kentucky	73	80	38	50	66	75	56	78
University of Iowa	82	88	67	104	47*	69	226	220
University of Kansas	66	54	56	56	56	46	229	214
American University	63	52	184	172	**	191	9	5
California State University at San Diego	53	94	91	128	86	118	13	41
Boston College	83	76	60	60	111	116	19*	12
Southwest Texas State University	96	93	**	152	**	164	22	15
North Texas State University	98	115	201	200	234	225	23	35
Northeastern University	58	70	98	107	72	83	25*	31
University of South Florida	64	98	124	155	94	130	27*	59

APPENDIX (continued)

Schools	Coe and Weinstock		Sharplin and Mabry		Academic		Practitioner	
	Total	Per Capita	Total	Per Capita	Total	Per Capita	Total	Per Capita
University of Hawaii at Hilo	89	87	102	108	114	127	31	29
City University of New York	57	N.A.	54	N.A.	59	N.A.	36	N.A.
Georgia State University	52	109	66	116	65	121	37	120
University of Miami	99	118	88	103	139	157	39*	71
Cleveland State University	71	81	63	76	89	92	44	67
University of Connecticut at Danbury	77	86	57	66	93	101	50	69
University of Wisconsin at Parkside	147	69	**	173	174	110	107	21
George Mason University	125	108	137	123	238	220	63*	34
University of New Mexico	103	64	123	90	96	67	88	36
Saint Louis University	115	96	130	111	159	147	68*	40
University of North Florida	131	106	151	132	174	156	77*	42
California State University at San Francisco	139	107	110	81	159	142	90*	43
University of Michigan at Dearborn	211	129	**	160	**	143	135*	45
Mississippi State University	125	123	145	137	201	185	68*	49
University of Wyoming	100	92	75	68	100	94	61	50

[a] The total figure refers to the level of total institutional productivity. The per capita figure refers to the level of per capita publications. N.A. means that data on the size of the business school's faculty were not available. An asterisk means a tied rank. A double asterisk means a rank beyond 300.

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Submissions should be sent to Professor Richard T. Mowday, *Academy of Management Journal,* College of Business Administration, University of Oregon, Eugene, Oregon 97403-1208.

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FROM THE EDITOR

Writing an editorial statement for the December issue shortly after the September one has been mailed offers a rare opportunity. For perhaps the first time since assuming the editorship, I can feel as if I'm several months ahead of schedule on *something*. The normal ebb and flow of this job involves a tremendous volume of papers coming into the office and an even larger volume of mail going out. It is difficult not to become overwhelmed by a sense of being constantly behind in your work, growing further behind by the moment. Of course, the thought that I might be ahead of schedule in writing this editorial is self-delusion—it probably should have been written months ago. I plan to enjoy it nonetheless.

The last issue of the 1988 volume provides an opportunity to express my appreciation to a number of individuals whose contributions have made the publication of the *Journal* this past year possible. In particular, I want to express my appreciation to the previous editor, Janice Beyer. All of the articles appearing in this volume were accepted during her editorship. In addition, I want to thank the officers of the Academy of Management, especially Walt Newsom, Don Hellriegel, and Art Bedeian. Their continued support has made my life a lot easier.

The last issue of this volume also provides an opportunity to thank the many people who have contributed to the *Journal* by providing thorough and competent reviews. A scholarly journal like *AMJ* depends on the willingness of literally hundreds of individuals who give freely of their time and expertise in reviewing. Individuals who have served as external reviewers during the past year or so are listed in the Acknowledgment of Reviewers section.

The three individuals who have served as Consulting Editors, John Fossum, Mike Hitt, and Kaye Schoonhoven, have played a critical role in reviewing papers and in helping authors develop their papers while under revision. In addition, the individuals who serve on the editorial board read many papers over the course of a year and are asked to provide authors with comprehensive and thoughtful comments. They provide an important service to Academy members. Several new individuals have joined the board during the past year and at least one veteran member, Jerry Porras, resigned because of other responsibilities. We will miss his contributions.

My duties this past year have also been made much easier by the capable assistance of several individuals who work quite closely with me. Steve Gomes, production editor, and Seph Doliner, copy editor, continue to perform above and beyond the call of duty. Dorothy Wynkoop, the secretary for the *Journal*, is the person who makes it all work.

In this issue, the Subject Index for Volume 31 appears. Prepared by Nancy Dodd, this index should prove invaluable to researchers needing to review the literature. In combination with the Title and Author Index, it provides a comprehensive record of the articles we have published this past year.

During the first fourteen months that I have been accepting new submissions, six of which I served as Associate Editor, 574 papers were received. The following statistics report the initial decisions made on these papers.

Initial Decisions: Submissions Received
July 15, 1987 to September 15, 1988

Manuscripts submitted	574	(100%)
Under initial review	56	(10%)
Returned without review	62	(11%)
Rejected after review	358	(62%)
Under revision	98	(17%)
Accepted for publication	0	(0%)

A few words of explanation concerning these statistics are in order. The percentage of papers accepted for publication obviously understates the annual acceptance rate for the *Journal*. It reflects the fact that no papers have been accepted for publication after the initial set of reviews. Instead, papers ultimately accepted for publication go through at least one revision and often several. A better feeling for the acceptance process can be gained by examining what happens to papers under revision. The relevant statistics are set forth below.

Revisions[a]

Status	First Revision	Second Revision	Third Revision
Not resubmitted	47	37	5
Withdrawn	2	0	0
Resubmitted			
Revision	26 (44%)	4 (20%)	0 (0%)
Rejected	16 (27%)	1 (5%)	0 (0%)
Under review	12 (20%)	3 (15%)	0 (0%)
Accepted	5 (9%)	12 (60%)	4 (100%)
Totals–resubmitted papers	59 (100%)	20 (100%)	4 (100%)

[a] Includes papers submitted under the previous editor but still under revision as of September 15, 1988.

Several conclusions can be drawn from these statistics. First, 21 papers have been accepted for publication, not zero as suggested above. Second, a rather large number of papers for which a revision has been invited have not been resubmitted. Whether or not the authors intend to revise and resubmit is simply impossible to know. Third, the chances of having a paper accepted for publication increase dramatically at each stage of the revision process. If the authors of papers who have been invited to resubmit a revision are wondering whether or not they should do so, the answer should be self-evident. Finally, while the *Journal* has a policy of making a decision after the first revision of a manuscript, it is not always possible. Even so, acceptance or rejection decisions have been made in 45 percent of the cases where a first revision has been resubmitted and completed the review process.

During the most recent two-month period for which accurate data are easily available, the following statistics reflect the turnaround time for submitted papers:

Days in Review Process

	Median	Mean
Rejected	34	38
Revisions	49	55
Under review	33	43

The somewhat longer time taken to turnaround papers that are revised reflects the fact that a consulting editor and/or myself get involved in the process after it has been reviewed by at least two other individuals. While this extends the time required to reach a decision on revisions, our goal is to provide comprehensive feedback during the early stages of the process so that fewer revisions are ultimately required.

Beginning with the March 1989 issue, we will include a short abstract (50 words) on all research notes published in the *Journal*. We believe this change will make the research notes more accessible to our readers and to abstracting services. While this change in policy will be formally reflected in the new Style Guide published in that issue, individuals who plan to submit a paper as a research note in the meantime should include an abstract.

The Consulting Editors and members of the editorial review board are dedicated to providing authors with good reviews and to improving the overall quality of the *Journal*. The positive feedback we have received suggests that many of you appreciate their efforts. Because we continually strive to do a better job, we also welcome constructive and thoughtful suggestions. Correspondence containing suggestions should be sent directly to the editor.

RTM

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POLITICS OF STRATEGIC DECISION MAKING IN HIGH-VELOCITY ENVIRONMENTS: TOWARD A MIDRANGE THEORY

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How do politics affect the strategic decision processes of top executives in the "high-velocity" microcomputer industry? We induced a midrange theory linking power, politics, and performance from a study of eight firms in the microcomputer industry. We found that politics—the observable, but often covert, actions by which executives enhance their power to influence decisions—arise from power centralization. Autocratic CEOs engage in politics and generate political behavior among subordinates. We also found that politics are not organized into shifting and temporary alliances based on issues. Rather, they are organized into stable coalitions based on demographic characteristics such as age and office location. Finally, politics within top management teams are associated with poor firm performance.

Most strategic decision processes are ultimately political in that they involve decisions with uncertain outcomes, actors with conflicting views, and resolution through the exercise of power (Allison, 1971). However, not all strategic-decision-making processes evidence politics. Pettigrew's (1973) study of decision making within a British retail firm contained numerous examples of political activity including agenda control, withholding information, and behind-the-scenes coalition formation. Politics played a major role (Pettigrew, 1973). In contrast, according to Allison's (1971) description, in the Cuban missile crisis the actors relied on open and forthright discussion, with full information, in group meetings to influence decision making. Although there was substantial conflict, there was little evidence of the behaviors which we have defined as politics.

The purpose of this study was to explore the politics of strategic decision making. We defined politics as our informants did. Politics are the

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observable, but often covert, actions by which executives enhance their power to influence a decision.[1] These actions include behind-the-scenes coalition formation, offline lobbying and cooptation attempts, withholding information, and controlling agendas (Pettigrew, 1973; Pfeffer, 1981). Politics contrast with the straightforward influence tactics of open and forthright discussion, with full sharing of information, in settings open to all decision makers.

The research setting was the high-velocity environment of the microcomputer industry. By high velocity, we mean those environments in which there is rapid and discontinuous change in demand, competitors, technology, or regulation, so that information is often inaccurate, unavailable, or obsolete (Bourgeois & Eisenhardt, 1988).[2] During our study (1984–85), the microcomputer industry was undergoing substantial technological change such as the introduction of UNIX, 64K RAMs, and RISC computer architecture, as well as competitive change such as the entry of IBM, decline of Texas Instruments, and double-digit growth in demand (Bell, 1984). Thompson (1967) hypothesized that political processes would accelerate in such dynamic conditions, yet our previous research (Bourgeois & Eisenhardt, 1988) indicated that politics were associated with poor performance in such environments.

We organized our research around three questions. First, why do politics emerge? Our interest was in why politics emerge among some executive groups, and not others. Do they arise from ambition, rivalry, or attempts to gain personal advantage (Schumpeter, 1934)? Or are they the natural outgrowth of conflict between functional units (March, 1962), centralization (Hage, 1980), or power imbalances within a top management team (Bachrach & Lawler, 1980)?

Second, what is the shape of politics? Some authors have suggested that politics are organized into warring factions, each engaging in a power struggle for supremacy (Butcher, 1988; Jay, 1967). If so, how do individuals choose allies, and how do coalitions evolve? Alternatively, others have suggested that politics are fluid (Stevenson, Pearce, & Porter, 1985). Individuals vary their political tactics from issue to issue, forming alliances based on payoffs and preferences. However, that view assumes people have the time to understand their own preferences, ascertain those of others, and engage in politics.

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[1] There are many definitions of politics (Gandz & Murray, 1980). Although our definition is narrower than some, this precision has advantages: our definition (1) captures the meaning of politics common in organizations (Gandz & Murray, 1980) and among our respondents, yielding better empirical validity; (2) distinguishes politics from related concepts such as conflict and power; (3) makes no empirically unobservable assumptions about the intentions of actors; and (4) captures meaningful differences in strategic decision making behavior across executive groups.

[2] The term, high velocity, refers to environments in which there is dynamism (Dess & Beard, 1984) overlaid by sharp and discontinuous change such as changing competitors, technology, or government regulation (Sutton, Eisenhardt, & Jucker, 1986). Using this definition, microcomputers and probably airlines are high-velocity industries. In contrast, although they score high on dynamism indices (Dess & Beard, 1984), cyclical industries such as machine tools are not.

Is such extensive cognitive processing realistic to assume, especially in high-velocity environments?

Third, how do politics affect firm performance? One view is that politics interfere with effective management (Jay, 1967). Empirical studies have indicated that this view is common in organizations (Gandz & Murray, 1980). However, other authors have taken the more balanced view that politics may be harmful in some situations and helpful in others (Pfeffer, 1981; Stevenson et al., 1985). However, the empirical evidence for all of these positions is limited (Pfeffer, 1981).

The conflicting answers to these questions and the limited research base on politics, especially regarding executive teams in fast-paced environments, led us to an inductive study. We found that politics arise from power centralization. Domination by powerful chief executive officers (CEOs), combined with the desire for control by top management teams, leads to politics. Conflict, although necessary, is not a sufficient condition for the emergence of politics. We also found that politics are not fluid. Rather, they become entrenched into stable patterns that are often based on characteristics such as age and office location. Finally, politics, because they restrict information flow and are time-consuming, are associated with poor firm performance. The empirical derivation of those ideas is the subject of this article.

RESEARCH METHOD

We studied the politics of top management teams in their natural setting, by means of what Yin (1984) termed multiple case design. Such a design allowed us to follow a replication logic (Yin, 1984), whereby multiple cases are treated as a series of experiments, each case serving to confirm or disconfirm the inferences drawn from previous ones.

Our study included 8 firms from the microcomputer industry in the San Francisco Bay Area. Each firm was functionally organized and privately held. We used theoretical sampling to determine our number of cases—that is, we stopped adding cases when our incremental learning diminished (Glaser & Strauss, 1967; Sutton & Callahan, 1987). We contacted 12 firms to obtain the 8 studied.

Data Sources

We interviewed every member of each top management team, including CEOs and their immediate subordinates. The teams typically included the heads of major functions such as sales, engineering, and finance. We relied on four data sources: (1) an initial interview with a firm's CEO, (2) semistructured interviews with every member of a top management team, (3) a questionnaire completed by each member of the team, and (4) secondary source data.

CEO interview. The entry interview with the CEO of each firm had a semistructured format. We began the interviews by asking the CEOs to describe the competitive strategy of their firm and its position within the industry. We then asked them to describe the distinctive competencies of the firm and key success factors in the industry. They then described their major competitors and rated the competitors' performance and their own firm's performance. After asking the CEOs to identify two or three recent or ongoing major decisions, we selected one decision to study in depth. We chose decisions that (1) involved strategic positioning, (2) had high stakes—outcomes the executives believed would have significant consequences for their firms, (3) were pervasive, involving as many functions of a firm as possible, and (4) represented the process by which a firm had made other major decisions. We then traced the making of the chosen decision from the perspective of every member of the top management team through semistructured interviews, described below. Table 1 lists each decision and gives descriptive statistics for each firm.

Team interviews. After our initial interview with a firm's CEO, we conducted semistructured interviews with every executive in the top management team. The interview consisted of 16 open-ended questions. Following the methods of inductive research, we supplemented these questions with ones that seemed fruitful to pursue during the interview. The interviews typically took 90 minutes, but occasionally took as long as three hours. We divided the interview into two parts. In the first part, we gained a general impression of the firm and the political climate surrounding the top management team. In the second part, we traced the decision that we had identified with the CEO.

Each interview began with our asking for a description of the firm's competitive strategy and its position within the industry. We then asked the

TABLE 1
Descriptions of the Eight Microcomputer Firms Studied

Firm	Number of Employees	Number of Informants	Decision Studied
First	115	6	Name change: Do we need a new name?
Alpha	50	5	New product: Should we develop an IBM-compatible product?
Cowboy	417	6	New product: What should our next product be?
Neutron	200	6	Alliance: Should we form a strategic alliance?
Omicron	192	9	Strategy: Do we need a new strategic direction?
Promise	185	6	Strategy: Do we need a new strategic direction?
Forefront	90	7	New product: What should our next product be?
Zap	500	7	Alliance: Should we form a strategic alliance or go "public"?

executive to describe (1) the firm's distinctive competencies, key industry success factors, and the functional strategy of his or her area within the firm; (2) colleagues, in whatever terms came to mind—descriptions of personality, skill levels, and functional background resulted; (3) the frequency and nature of interactions with each colleague; and (4) any routine decision-making sessions, in terms of conflicts, consensus, cordiality, and so forth. The last item provided us with a sense of the culture of the top management team.

In the second portion of the interview, we traced the history of the strategic decision identified in our entry interview with the CEO. We traced the decision from the perspective of every participant, using a standard set of interview questions. We asked questions, which concentrated on facts and events, using standard courtroom interrogation (e.g., "When did this first become an issue?").

Each interview was conducted in tandem—by two investigators—with one primarily responsible for the interview and the other for taking notes and filling in gaps in the questioning. Immediately after an interview, the investigators cross-checked facts and recorded their impressions. We followed several rules for within-case analysis (Yin, 1984). The "24 hour" rule required that detailed interview notes and impressions be completed within one day of the interview. A second rule was to include all data, regardless of its apparent importance at the interview. A third rule was to end our interview notes with our own ongoing impressions. We tried to sharpen those impressions by asking ourselves questions (e.g., "What did I learn?" "How does this interview compare to prior interviews?").

Questionnaires. We also obtained quantitative data on political patterns within each top management team from questionnaires introduced during interviews. The questions focused on variables from research on politics (e.g., Hinings, Hickson, Pennings, & Schneck, 1974). We measured goal conflicts, alliance formation, interpersonal disagreements, and power. From these data, we developed power maps and alliance network diagrams for each executive team. The Appendix describes the questions, their administration, and computation of the variables.

Secondary-source and other data. We examined available industry reports and internal documents and made informal observations. We obtained data on office location, demographics of team members, and each firm's financial performance. Finally, we also observed a day-long strategy-making session in one firm.

Data Analysis

Unlike hypothesis-testing research, inductive research lacks a generally accepted model for its central creative process. In the absence of a standard, we used the following approach: after collecting both qualitative and quantitative data from each firm, each author independently analyzed one of the data types. For each firm, one author calculated group-level scores of conflict, power, alliance formation, and so forth. That author then analyzed those data for patterns. The other author combined qualitative responses. We developed profiles of each executive from the descriptions given by each member of the top management team, including traits mentioned by more than one executive in the profiles. For example, Don, the CEO of Alpha Computer, was described as "impatient" by three of his four colleagues. We thus included this trait in Don's profile, whereas other traits that only one person mentioned (e.g., "large ego") were dropped. This approach was also used to profile the decision climate.

"Decision stories" were developed by combining the accounts of each executive into a time line beginning with decision initiation. We included all events mentioned. In each firm, team members agreed on the critical issues of when the decision began, when it was made, and how it was made. For example, at Alpha the executives all agreed that the impetus for the decision was a board meeting, that the CEO made the decision alone, and that he did so just before the annual planning conference. Also, all Alpha executives, including the president, agreed that the decision was unpopular. Although they were few, conflicting reports were preserved. They usually concerned one person's assumptions about another's motives or opinions, not observable actions and events.

Once each of us had developed preliminary hypotheses from our respective data sets, we exchanged analyses and searched for patterns in the data. That search was assisted by taking pairs of firms and listing similarities and differences between each pair. From this pairwise comparison, we induced tentative relationships between variables. We then went back to each case to see if the relationship was confirmed, and if it was, to use the case to develop a better understanding of the underlying dynamics. After many iterations between data and propositions, we used comparisons with existing literature to sharpen our insights. What emerged were propositions linking power centralization, politics, and economic performance. As in deductive research, our propositions fit well with the evidence, but did not perfectly explain the cases (Sutton & Callahan, 1987).

THE ORIGINS OF POLITICS

Why do politics arise? Many authors have argued that the source of politics is conflict (Baldridge, 1971; March, 1962; Pfeffer, 1981). Absent conflict, there is no need for people to use politics to influence decision making. Many authors have also argued that politics arise when power is decentralized (Dean, Sharfman, & Ford, 1987; Hage, 1980; Pfeffer, 1981). When the power of individual actors is roughly equivalent, individuals band together to influence decision processes. Conversely, when power is highly centralized, conflict is submerged and the use of politics declines (Pfeffer, 1981).

The evidence from our data tells a different story. Although conflict was important, power imbalance was crucial. Specifically, the use of politics was closely linked to centralized, not decentralized, decision making. The more powerful a CEO, the greater the tendency among remaining executives to consolidate power and engage in alliance and insurgency behaviors, while the CEO engaged in tactics for controlling and withholding information. In formal terms,

> *Proposition 1: The greater the centralization of power in a chief executive, the greater the use of politics within a top management team.*

Table 2 summarizes the distribution of power within the top management teams of our firms. Consistent with the methods of others (Baldridge, 1971; Patchen, 1974; Pfeffer & Salancik, 1974), our measures of power emphasized influence on major decisions and used multiple indicators. We quantitatively measured CEO power on a 0 to 10 scale rating influence on ten key decision areas. We also measured the power of the next most powerful executive and the number of functional areas in which a CEO, rather than the functional vice president (VP), was the principal decision maker on the team. We qualitatively assessed CEO power using descriptions of CEOs, descriptions of the decision climates and team interactions, and the stories of the decision-making processes by which specific strategic decisions had been reached.

Table 3 summarizes the use of politics in each team. We quantitatively measured politics using a questionnaire item on the frequency of alliance behavior between pairs of executives and qualitatively assessed the incidence of politics by searching the interview data for behaviors by which executives tried to influence decision making indirectly, covertly, or, as Pfeffer (1981) described, unobtrusively. We distinguished between the use of evidence and full disclosure of information in open meetings, and the tactics of politics—observable, but often covert, actions by which executives enhanced their power to influence decision making. Consistent with our respondents, we considered behaviors such as formation of insurgency groups, internal and external alliances, withholding information, agenda control, and private attempts to coopt or lobby key executives to be examples of politics. The political tactics we identified were similar to those identified by Pettigrew (1973) and Pfeffer (1981).

The results shown in Tables 2 and 3 indicate that there is wide variation in the use of politics across top management teams and that the variation is closely related to the centralization of power. In fact, the first four firms listed—First, Alpha, Cowboy, and Neutron—scored highest on both power-centralization and politics measures. We refer to those firms throughout this article as the politically active firms. By contrast, the second four firms, Omicron, Promise, Forefront, and Zap, scored lower on those measures.

For example, the chairman of First had the highest power score of our CEOs, 9.6 on a 0 to 10 scale rating influence on ten key decision areas. His distance on the power scale from the next most powerful person was 3.5, the second largest gap in the set of firms. The chairman was also the principal decision maker in every functional area. Anecdotes from our interviews corroborated the quantitative data. One executive told us: "When Geoff makes

TABLE 2
Power Centralization

Firm	CEO's Description	CEO's Power Score	CEO's Power Distance[a]	CEO-dominated Functions	Decision Style[b]	Examples
First	Strong Volatile Dogmatic	9.6	3.5	Marketing, R&D, Manufacturing, Finance	Authoritarian	Geoff [chairman] is the decision maker. He runs the whole show (VP, marketing).
Alpha	Impatient Parental Tunes you out	9.6	3.8	Marketing, R&D, Manufacturing, Finance	Authoritarian	Thou shalt not hire without presidential approval. Thou shalt not promote without presidential approval. Thou shalt not explore new markets without presidential approval (VP, operations).
Cowboy	Strong Power boss Master strategist	9.1	3.1	Marketing, R&D, Finance	Authoritarian-Consensus[c]	The tone of meetings would change depending upon whether he was in the room. If he'd leave the room, discussion would spread out, go off the wall. It got back on focus when he came back (director of marketing).
Neutron	Organized Analytic	9.1	2.3	Marketing, Manufacturing, Finance	Authoritarian	If there is a decision to make, I will make it (president).
Omicron	Easygoing Easy to work with	8.4	1.2	Finance	Consensus	Bill [prior CEO] was a suppressor of ideas. Jim is more open (VP, manufacturing).

TABLE 2 (continued)

Firm	CEO's Description	CEO's Power Score	CEO's Power Distance[a]	CEO-dominated Functions	Decision Style[b]	Examples
Promise	People-oriented Pragmatic	8.9	1.3	Manufacturing, Finance	Consensus	[My philosophy is] to make quick decisions involving as many people as possible (president).
Forefront	Aggressive Team player	8.3	1.2	None	Consensus	Art [president] depends on picking good people and letting them operate (VP, sales).
Zap	Consensus-style People-oriented	7.5	0.3	Finance	Consultative	It's very open. We're successful most of the time in building consensus (VP, engineering).

[a] The difference between a CEO's power score and the score of the next most powerful executive.

[b] We categorized decision-making style on the basis of information in the decision stories. Authoritarian = decisions made by CEO alone or in consultation with only one person. Consultative = decisions made by CEO in consultation with most or all of the team. Consensus = decisions made by entire team as a group.

[c] The president used a consensual style to develop plans for a new computer product after he had chosen the microprocessor and operating system in an authoritarian style.

TABLE 3
Use of Politics[a]

Firm	Withholding Informaton	Controlling Agenda	Alliance Score	Coöptation of Key Decision Makers	Outlaw Staff Meetings	External Alliances	Examples
First	S	S	5.2	I,S	I	S	The consultants legitimized our view of the situation. We wouldn't have been able to do it without them (VP, marketing).
Alpha	I,S	S	4.5	I,S	I		He [another VP] does all the games and hidden agendas. He needs power (VP, R&D).
Cowboy	S	S	5.2	I			Hal [president] is very effective at manipulating ideas (director of marketing).
Neutron	S	S	4.9				I had the whole room up and shouting. I had them in the palm of my hand (president).
Omicron		S	3.8				The politics of Omicron are becoming less and less. I'm not aware of any politics lately (VP, manufacturing).
Promise			3.2				At most companies the early talk is to get allies, but not here—we don't have any superegos (VP, finance).

TABLE 3 (continued)

Firm	Withholding Informaton	Controlling Agenda	Alliance Score	Cooptation of Key Decision Makers	Outlaw Staff Meetings	External Alliances	Examples
Forefront			4.4				You don't need to get the others behind you before the meeting. If you can explain your view, people will change their opinions. Forefront is not political at this point (VP, manufacturing).
Zap			3.7				There isn't any premeeting politicking —there isn't any time (VP, marketing).

[a] I = strong support from the interviews (evidence from multiple individuals).
i = modest support from the interviews (evidence from a single individual).
S = strong support from the decision story (evidence from multiple individuals).
s = modest support from the decision story (evidence from a single individual).

a decision, it's like God." Another said: "Geoff is *the* decision maker. He runs the whole show." A third said: "Most decisions around here are made at the top." One executive used understatement to sum up the power of the chairman, remarking "This is not a democracy."

As indicated in Table 3, there was extensive use of politics at First. The company ranked at the top of the eight cases in the use of alliances, which we defined as behind-the-scenes coalition building among proponents of a particular view. First's executives relied heavily on such banding together and even held "outlaw staff meetings" (the executives' term), in which the VPs of marketing, finance, and operations met regularly outside the formal chain of command. The meetings circumvented the chairman and "[kept] issues ironed out between us."

First's VPs also reported using cooptation, which we defined as private attempts to change the position of a key decision maker. The VPs of marketing, finance, and manufacturing all told us that they tried to influence decisions through one-on-one meetings with the president, who sat between them and the chairman on the organization chart. Politics also surfaced in the strategic decision that we studied at First. Several of the VPs tried to coopt the president, first to change the decision and then to delay its implementation. For example, the VP of finance told us: "I went to Bob [the president], who said his hands were tied." The VP of marketing said: "I tried to slow down the implementation as much as possible. . . . I talked to the president about that." This same individual then went on to describe how he tried to form an alliance with external consultants to push his view: "I also had the consultants make a presentation to the chairman. They legitimized our view of the situation."

Overall, the atmosphere at First was one of frustration. The VP of sales described the situation well: "The atmosphere is frustrating. Geoff goes off on a lot of tangents. He tends to have already made up his mind, and we spend time just trying to change his mind. I get frustrated because he doesn't really listen when you talk to him." We did not find evidence that First executives enjoyed politics. Rather, the executives felt that politics were necessary to counter the power of the chairman and to get things done. For example, the rationale for the outlaw staff meetings was described as: "It takes the place of what we think should happen at weekly staff meetings." Another executive summed up the rationale for cooptation: "You HAVE to build a case through him [the president] and have it presented to the chairman." The VP of marketing described the reason for his use of external alliances: "The consultants legitimized our view of the situation. We wouldn't have been able to do it without them. We would have been labeled foot-draggers." Most felt like the executive who told us: "Sometimes I wish that Geoff would go away for six months!"

Alpha is another example of a firm with a powerful leader and an executive team engaged in politics. The CEO (the president) was described as a "parent" and "benevolent dictator." His power score was 9.6, tied for highest in our cases. The next most powerful executive at Alpha scored only 5.8.

The strategic decision we studied corroborated those data. For example, the VP of sales said of the decision process: "The decision was a Don Rogers edict—not a vote." The president agreed: "I made the decision myself, despite the objections of everyone. I said 'the hell with it, let's go with the PC interface.' "

We also found strong evidence of politics at Alpha. For example, several of the VPs described others as "political," "secretive," and "close to the vest." This secretiveness was perceived as jockeying for power through the control of information (Pettigrew, 1973). As one VP told us: "Rich was trying to get Don's ear and since I had been close to Don for a long time, he would skip me." The VP of R&D described the VP of sales in the following way: "He does all the games and the hidden agendas. He needs power." Another executive told us of attempts to coopt the president by everyone. He explained: "We [the top management] are all trying to establish a pecking order among the VPs."

Frustration was evident at Alpha. For example, the president frequently withheld information. As one executive told us: "Don collects a lot of information, but he often doesn't share it. When he does share information, he prefers to give out partial information in one-on-one meetings." The VPs reacted with their own brand of politics: outlaw staff meetings. As one executive said: "We started having outlaw meetings where we would meet without Don to share information. It appeared like we weren't getting a lot of information as a group—Don was distributing information piecemeal to each person." The outlaw meetings were effective. This individual continued: "One result of the meetings was that we gave Don a list of the things we needed. We got some things—we even got regular staff meetings."

By contrast, we found less centralized power along with less politics at Omicron, Promise, Forefront, and Zap. As Table 3 indicates, these top management teams reported less alliance behavior than did the politically active teams. Our qualitative data did not reveal one-on-one attempts by executives to coopt key individuals. Neither did we see alliances with external individuals such as consultants. Nor was there withholding of information by the CEO or by others. We saw no outlaw meetings or other attempts at insurrection. In short, we saw little evidence of politics in the teams with decentralized power.

What we did see in those teams was evidence that their CEOs shared power and information. For example, the CEOs were described by phrases like "consensus style," "people-oriented," and "team player." As Table 2 indicates, the power scores of the CEOs of these firms are lower than those of the CEOs of the politically active firms, and the distances between them and the other executives on the power scale are much smaller. Although the CEOs are still powerful executives, their functional VPs are usually the key decision makers in their own areas (see Table 2).

Our decision stories corroborate this. The Omicron decision to reassess strategic direction was conducted primarily in group meetings spread over several months, providing many opportunities for top managers to contribute.

The Forefront new-product decision was a consensus decision made in a team meeting. Promise also had a consensus decision made over several months and finalized at a multiple-day retreat attended by all top managers. The Zap alliance decision was made by the CEO in consultation with the VPs of sales, finance, and engineering. The rest of the top managers were kept informed at weekly staff meetings and planned the implementation as it related to their functional areas.

Our cases suggest that executives in these politically less active teams regard politics as unnecessary. For example, one VP at Promise told us: "At most companies the early talk is to try to get allies, but not here—we don't have any superegos." The VP of manufacturing at Forefront said: "If you can present your ideas, people will change their opinions. We're not political at this point." These executives also regarded politics as unnecessarily time-consuming. For example, the VP of marketing at Zap told us: "I don't have time to lobby, I hardly have time to make the meetings." The VP of sales said: "There isn't any premeeting politicking; there isn't any time. I just manage to get to the meetings." The VP of engineering at Zap summed up the prevailing view: "Lobbying isn't a good use of time."

The difference between our results, and those of other authors (Baldridge, 1971; Pfeffer, 1981) may be related to differences in setting: universities versus corporations. Other research has suggested that universities have unusually decentralized power structures (March & Olsen, 1976). If this extreme decentralization exists, it may lead to the same frustration and inability to accomplish objectives without politics that we saw in our top management teams at the extreme of high centralization. Perhaps extreme decentralization so dilutes power that action is possible only through politics. Possibly then, politics emerge at the extremes of power imbalance—high centralization and high decentralization—but do not emerge with moderate decentralization.

Our results also have similarities with the findings of studies of democratic and autocratic leadership (e.g., Leavitt, 1951; White & Lippitt, 1960). Both our results and theirs suggest that autocratic leaders create frustration among their subordinates. In those studies the frustration led to abuse and withdrawal among children (White & Lippitt, 1960) or to dissatisfaction among laboratory subjects (Leavitt, 1951). Our executives, engaged in actual high-stakes decisions, manifested their frustrations through politics.

Conflict, Power, and Politics

Some authors (March, 1962; Mintzburg, 1983) have argued that the root of political behavior is conflict. Our data also indicate that conflict affects politics. For example, the decision at Neutron was less characterized by politics than those at Alpha and First, at least in part because the Neutron decision was in itself less controversial (Tables 2 and 4). By contrast, all executives at Alpha and First disagreed with the decision, and their use of politics was vigorous. However, our data also indicate that conflict does not necessarily result in politics. At Omicron, Zap, and Forefront, there was extensive conflict. However, in each case, the conflict was resolved without politics. In more formal terms,

> *Proposition 2: Conflict is not a sufficient condition for the use of politics. Rather, conflict leads to politics only when power is centralized.*

Table 4 summarizes the data grounding this proposition. We quantitatively assessed conflict in terms of (1) disagreement on organizational goals, (2) disagreement on the importance of key strategic decisions, and (3) interpersonal disagreement among key executives. Qualitatively, we assessed the decision climate and tallied the agreement on the decision studied at each firm.

The data reveal that high conflict is associated with politics when a CEO is very powerful (e.g., First), but not when a CEO shares power (e.g., Zap). Forefront's executives are an example of a team experiencing relatively high conflict yet low politics. As Table 4 indicates, Forefront's conflict scores are moderate to high among the cases. Anecdotes from our interviews strengthen the quantitative data. One executive told us: "There is a lot of disagreement. We air opinions and they're often heated. They're even abusive and insulting sometimes. . . . We argue about most things." Another VP said: "There is a lot of debate. There is a lot of disagreement. . . . Art [the president] doesn't want yes people."

Despite this conflict, we saw little evidence of politics at Forefront. Rather, the executives seemed to operate using open argument. As the VP of manufacturing said: "You don't need to get the others behind you before the meeting. If you can explain your view [at a meeting], people will change

TABLE 4
Conflict on Top Management Teams

Firm	Goal Conflict[a]	Policy Conflict[b]	Interpersonal Disagreement	Rank[c]	Decision Conflict[d]
First	2.01	1.78	4.1	3	Disagreement
Alpha	1.43	1.87	3.3	6	Disagreement
Cowboy[d]	2.05	2.39	3.7	2	Agreement
Neutron	1.36	2.14	3.3	5	Agreement
Omicron	1.84	1.58	3.2	8	Mixed
Promise	1.83	1.99	3.1	7	Agreement
Forefront	1.83	2.06	3.3	4	Mixed
Zap	2.13	2.58	3.8	1	Mixed

[a] Sum of within-team variance on importance of each goal (see the Appendix).

[b] Sum of variances on importance of key decision areas (see the Appendix).

[c] Rank was determined by computing the mean of a team's rank from the first three columns.

[d] Disagreement = final decision opposed by the entire team. Mixed = final decision opposed by some on team. Agreement = final decision agreed to by the entire team. Although the Cowboy team scored high on the quantitative measures of conflict, there was high agreement on the decision that we studied in depth.

their opinions. Forefront is not political at this point. But you must give your reasons or your ideas don't count." This theme of forthright discussion, instead of behind-the-scenes politicking, was echoed by the VP of finance: "There is some open disagreement—it's not covered up. We don't gloss over the issues, we hit them straight on." The firm's president said: "I prefer a 'stand up for what you think' approach."

The new-product decision we studied at Forefront corroborated the emphasis on open discussion. New product introductions are particularly critical in this industry because of the short product life cycles and the rapid changes in technology. Some executives favored an incremental product that could be rapidly introduced to counter the new product of a major competitor. However, other executives thought that such a product would cannibalize existing product revenues and dilute engineering resources. They preferred to introduce an innovative product, even though doing so would take more time. There was a series of meetings. The final decision was made through intense discussion at one such meeting. The VP of sales described the process: "The attitude is that if we disagree, we'll fight until someone changes his mind. It's painful." How was the conflict resolved? One VP described the decision as a push for consensus, followed by the CEO's decision: "When everybody sounded like they wanted it, Art [the president] said it sounds good. When he joins in, that's the consensus."

Our results at Zap and Promise echoed this approach to conflict resolution. What they describe is not simply consensus. Rather, one VP at Promise termed the approach "consensus with qualification." A team would try to reach consensus through an open airing of views, but if consensus failed, the CEO and often the relevant vice president would make the decision. Although the consensus with qualification process is political in the sense that the final decision is often a judgment by the most powerful individuals, the influence process employs open argument and full sharing of information, not politics.

Zap illustrates this process of conflict resolution. As one VP stated: "It's very open. . . . We're successful most of the time in building consensus. Otherwise, Randy [CEO] makes the decision." The decision we studied at Zap corroborated their use of a consensus-with-qualification approach. The decision, concerning how to raise additional money, involved choosing whether the firm should go public or engage in a strategic alliance for an infusion of private funds. There was substantial conflict because of uncertainty about the stock market and the impact on recruiting key engineers. All the executives claimed that the entire team discussed the issue, with everyone participating and informed. One executive described the approach to the conflict as "open and forthright." Another said: "It's very open. . . . The meetings are fairly rigorous. We talk as a group, not committees—the meetings are intense and we usually walk out with a decision." The president made the final decision to form an alliance. Although some executives opposed the decision, we saw no evidence of politics. Rather, as the VP of engineering told us: "I think we should have gone [public]. But my position is well known, and lobbying is not a good use of time." The VP of manufacturing, who would have personally profited immensely in a public offering, told us: "I'm satisified just to bring the issue up." The VP of marketing summarized conflict resolution at Zap: "We scream a lot, laugh, and then resolve the issue."

Why do our results fail to support the view that politics are driven by conflict (Cyert & March, 1963; Stevenson et al., 1985)? That view assumes that the primary way to resolve conflict over substantive policy issues is the use of politics. Such an assumption may be valid for legislative voting (Riker, 1962), laboratory games (Gamson, 1961; Murnighan, 1978), and budget allocation decisions (Baldridge, 1971; Pfeffer & Salancik, 1974) from which political models have been developed. The structure of the conflict in each of those situations is a competitive game. There are winners and losers—what benefits one person harms another.

In contrast, in our cases the major decisions addressed survival in times of rapid change. The key decisions involved charting a strategy, changing to a new technology, and creating additional financing. These are not zero-sum, competitive situations as are many laboratory simulations (Murnighan, 1978) and budget allocation decisions (Pfeffer & Salancik, 1974). Rather, each decision was collaborative. It was in the interests of every executive to obtain the best possible decision because the decision was critical to the future, to even the survival, of the firm.

Where power was relatively decentralized, we found that the team maintained a collaborative viewpoint. In effect, we found cooperative behavior focusing on group, rather than individual, goals. The comment of the VP of engineering at Zap was typical: "We emphasize a company view rather than a functional view most of the time." Although it is probably naive to assume that the executives were always able to do this, his statement nonetheless typifies the collaborative orientation. The executives argued, often strenuously, for their views in an open forum and avoided politics.

Where power was centralized, we found competition among executives. For example, Alpha executives talked about "establishing a pecking order among the VPs." Dominant CEOs transformed a collaborative situation into a competitive one, and politics emerged as people competed for the time and attention of the CEO.

THE ORGANIZATION OF POLITICS

What is the shape of political behavior? Political activity has often been described as organized into temporary and shifting alliances (Bachrach & Lawler, 1980; Gamson, 1961; March, 1962). The argument is that individuals form alliances around common points of view on a given issue in order to enhance their influence on the decision and the alliances disband when the issue is resolved. Further, Pfeffer (1981) argued that individuals try to make these alliances as large as possible in order to smooth implementation.

Our data, by contrast, suggest that coalition patterns are stable. Executives do not shift allies as issues change, particularly in politically active teams. Rather, they develop stable coalitions with one or possibly two other executives. They routinely seek out alliances with the same people. When usual allies disagree on an issue, they generally do not seek out more favorably disposed executives. Rather, they either drop the issue or pursue their interests alone.

> *Proposition 3: The greater the use of politics within a top management team, the greater the likelihood of stable alliance patterns.*

Table 5 summarizes the quantitative data that we used to ground our ideas on stable alliance patterns. The first column in Table 5 gives the variance in alliance scores across the teams. Large variances indicate more stable alliance patterns: executives formed alliances frequently with some executives and infrequently with others. Conversely, a low variance suggests shifting alliances, a pattern in which executives formed alliances with each other executive on their team with similar frequency. We also assessed the number of what we termed stable coalitions in each team. We considered an alliance to be a stable coalition when the mean frequency of alliance formation between two executives was at least 7 on a 0 to 10 scale (see the Appendix). No executive was in more than one stable coalition. Finally, we calculated the percentage of top management executives who participated in stable coalitions.

The data suggest that politically active top management teams are likely to be organized into stable alliance patterns. For example, the top management team at First was politically active and had a stable alliance pattern. All the executives at First could be identified with a stable coalition, and the variance score is the second highest among the teams. The VP of sales had a typical alliance profile for the top managers at First. He rated the frequency of his allying with the VP of marketing an 8 and the frequency of his allying

TABLE 5
Stability of Alliance Patterns

Firm	Variance in Alliance Scores	Number of Stable Coalitions[a]	Percentage of Executives in Stable Coalitions
First	2.95	3	100
Alpha	2.90	2	80
Cowboy	3.75	2	85
Neutron	2.82	1	30
Omicron	2.62	1	33
Promise	2.29	0	0
Forefront	2.50	0	0
Zap	2.43	0	0

[a] A stable coalition was defined as existing when the mean alliance score between executives was at least 7 on a 0 to 10 scale (see the Appendix).

with the rest of the team a 0 (0–10 scale, with 10 = constantly). His qualitative responses were consistent. Describing his relationship with the VP of marketing, he said: "Often it's our building against everyone else. We are the bad guys."

In contrast, the teams at Zap, Forefront, and Promise were not only less likely to use alliances but were more fluid in their alliance patterns. Their variance scores were smaller, and none of their executives had formed stable coalitions. The qualitative data support those findings. For example, the VP of marketing at Zap told us: "It [the alliance pattern] really switches. Patterns just aren't that evident." She went on to say: "Actually I don't have a lot of time to lobby."

Why do stable alliance patterns emerge? A possible reason, one consistent with the threat-rigidity hypothesis (Staw, Sandelands, & Dutton, 1981), is that politically active teams have stressful cultures, leading executives to rely on habitual responses like stable coalitions. Our data indicate that stressful and even threatening cultures were prevalent in the firms with politically active teams. For example, the VPs of R&D and operations at Alpha were described as "burned out." Another executive spoke of being "sabotaged." At Neutron, meetings were described as "confrontive—Jim [CEO] beats us up when we don't meet our goals." At First, one executive described the decision climate as "violent." Another described the CEO as "a gun about to go off, but you never know in what direction he will fire." Several executives alluded to being "caught in the crossfire." Another VP told us: "In fact, we used to joke about which one of us would get chewed out at a meeting. If he [the CEO] attacks, we don't get much done in the meeting. . . . It isn't smart to challenge Geoff in a group. He'll lash back." Perhaps then, stable alliance patterns are a rigidity response to the stressful and threatening environment of politically active teams.

A second reason for stable alliance patterns may be that executives do not engage in the extensive cognitive processing necessary for ascertaining the preferences of others and planning political actions. Rather, consistent with bounded rationality arguments (Cyert & March, 1963), they make convenient assumptions about the opinions of others and fall into familiar patterns of politicking.

For example, as described earlier, all executives opposed the chairman's decision to change the name of First, with the VPs of finance and marketing being the most active in their opposition. However, they persisted in familiar behaviors—that is, both tried to coopt the president and to engage their respective coalition partners. However, the VP of sales, the coalition partner of the VP of marketing, was busy with sales channel problems, and the VP of manufacturing, the coalition partner of the VP of finance, simply decided that he was too busy to bother. The finance and marketing executives never did join forces. We asked why. The VP of marketing claimed: "This is more of a marketing issue—it didn't concern finance. I didn't try to get Tim [VP of finance] involved with me." The VP of finance responded: "Jon [VP of marketing] and I usually disagree. We have a very different view of the world."

Neither executive was aware of the views of the other, and neither even considered the possibility that they might effectively ally.

The story at Alpha was similar. The VPs of R&D and sales particularly opposed the development of an IBM-compatible product that the president favored. However, as at First, these executives persisted in the routine use of politics. They tried to lobby the president and garner support within their usual coalitions. However, they did not attempt to cross coalition boundaries. We asked the VP of sales if he had considered allying with the VP of R&D on this issue. He replied: "It doesn't matter what he thinks—sales is necessary for the decision to go." The R&D executive said: "I didn't understand what Rich [VP of sales] was doing until the very end. We didn't talk much. I was too busy with what I was doing, and he probably wouldn't hear what I was saying anyway."

Finally, Cowboy's top management team consisted primarily of executives who had worked together at another firm. When they arrived at Cowboy, they simply maintained the patterns established previously. The only Cowboy executive who did not belong to a stable coalition had also not worked at the previous firm.

Why do our results fail to support the view (Bachrach & Lawler, 1980; Stevenson et al., 1985) that political activity is organized into temporary and shifting alliances? One reason may be environment. Rapid and discontinuous changes in technology, competition, and demand characterize the microcomputer industry. In such a fast-paced environment, executives simply may not have the time to engage in the extensive cognitive processing necessary for forming fluid alliances. A second reason may be that the evidence for shifting alliances has been largely based on the results of laboratory studies of one-time-only coalition formation under conditions of perfect information about payoffs and preferences (Gamson, 1961; Murnighan, 1978). Such studies probably do not capture the information uncertainty and complexity of a real environment or the stressful culture of a continuously political team, both of which may lead executives to habitual behavior patterns.

Coalitions and Demographics of Team Members

The literature on politics has often argued that people will form alliances on the basis of agreement on issues (Gamson, 1961). Taking that view, we would expect executives to form alliances on the basis of issue-specific agreement. However, as discussed above, fluid alliances around issues did not form in the politically active teams. Rather, coalitions developed on the basis of demographic factors such as age, office location, similarity of titles, and prior experience together. Thus,

> *Proposition 4: When the use of politics is high, the basis of alliance is likely to be similarity of demographic attributes.*

In Table 6, we have listed the stable coalitions, their demographic commonalities, and examples of the relationships between coalition members.

As indicated in the table, similarities in demographic attributes such as age, status, office location, and experience together occurred in all but one stable coalition. Age differences played a role in several of the stable coalitions. For example, the VPs of finance and manufacturing at First formed a coalition. They were both in their early 30s and were at least 15 years younger than the rest of the team.

Past history together is also an important factor. For example, as described above, Alpha had two coalitions: the VPs of R&D and operations,

TABLE 6
Demographics of Stable Coalitions[a]

Firm	Commonalities	Examples
First		
Chairman–president	Adjoining offices Highest-status titles	We talk about every thing and nothing. We're a good pair (president).
VP, finance–VP, manufacturing	School friends Youngest by 15 years	We are good friends (VP, finance).
VP, sales–VP, marketing	Adjoining offices in separate building	We are the "bad guys" (VP, sales).
Alpha		
VP, finance–VP, sales	Adjoining offices Joined firm at the same time	We talk about every thing (VP, sales).
VP, R&D–VP, operations	Joined firm at the same time	Nice guy. Fits with me (VP, operations).
Cowboy		
VP, manufacturing–VP, human relations–VP, finance	Same-status titles Prior experience together Oldest	
Director, software–director, marketing	Same-status titles Joined firm at the same time Prior experience together Youngest	I like Jon. I understand what makes him tick (director, software).
Neutron		
VP, sales–VP, marketing		
Omicron		
Chairman–VP, corporate development–VP, strategic planning	Cofounders of Omicron Cofounders of prior firm School friends	Alter egos (VP, operations).
Promise	No stable coalitions	
Forefront	No stable coalitions	
Zap	No stable coalitions	

[a] A stable coalition was defined as existing when the mean alliance score between executives was at least 7 on a 0 to 10 scale (see the Appendix).

and VPs of finance and sales. In the first coalition, the two executives were among Alpha's original employees and had worked together for eight years. In contrast, the VPs of sales and finance joined the firm at the same time, about two years prior to our study. The same type of pattern existed at Cowboy. The directors of marketing and software, who formed a coalition, had worked together at a prior firm, and they joined Cowboy at the same time, about one year before the other executives. At Omicron, the VP of corporate development and the chairman had a long history together, including being school friends and the cofounders of both Omicron and a prior firm.

Office location is also an important factor in coalition formation. The VPs of sales and marketing at First had adjoining offices in a building about one mile from the work site of the rest of the executives. The chairman and the president had adjoining offices. Only the VP of manufacturing was located in their building and he was on its opposite side, on the manufacturing floor. The VPs of sales and finance at Alpha had adjoining offices while the VP of operations was at the other end of the building and the VP of R&D was located in another building.

Finally, status differences play a role in coalition formation. For example, at Cowboy, VPs formed one coalition and directors formed the other. At Omicron, the two cofounders engaged in a coalition. At First, the president and chairman were in one coalition, and VPs were in the others.

Our results are similar to those of studies of interpersonal attraction that have associated propinquity (Festinger, Shachter, & Back, 1950), similarity (Newcomb, 1961), and simply time together (Newcomb, 1956) with the formation of friendships. This similarity of results suggests that the same factors that predict friendships also predict alliance patterns. People choose to ally with those with whom they interact frequently and with whom they feel comfortable. The qualitative data in Table 6 corroborate this view. For example, executives in many of the coalitions described their coalition relationships with affection—"good friends," a "good pair," and a "good team" were among the phrases used. In contrast, the more Machiavellian rational view would suggest that alliances are based on similar opinions on issues. Our finding, that alliances are not particularly issue-based, is consistent with the views that most people are not comfortable with politics (Gandz & Murray, 1980), that they use politics only when they think that they must, and that when they do use politics they try to engage safe, familiar allies. Overall, our finding gives further credence to the existence of a social, rather than an ideological, basis of alliance formation.

Our fourth proposition also relates to the demographic approach to the study of top management teams (e.g., Hambrick & Mason, 1984; Wagner, Pfeffer, & O'Rielly, 1985). The evidence from our cases is consistent with the view that demographics can play an important role in the functioning of top management teams. However, our results differ from those of previous research in that the existence of such demographic patterning is not causal. Demographics did not trigger political action. For example, the Forefront, Zap, and Promise top management teams did not have stable coalitions, despite having demographic patterns such as adjoining offices and prior history together. As at Cowboy, many of the Promise executives had worked together at another firm. However, these executives did not form stable coalitions. Two Forefront executives had gone to school together, but they were not stable allies. Several of the Zap executives were 15 to 20 years younger than some of the others. However, coalitions along age lines did not develop at the firm. In these firms, some executives had adjoining offices, while others were elsewhere, even in other buildings. Again, stable coalitions did not develop. Therefore, our evidence suggests that when conditions are ripe for politics, demographics play a role. However, demographic patterns do not produce politics. Moreover, simply studying demographics would probably have led to overprediction of the extent of political behavior and to missing the true nature of politics within the teams.

> *Proposition 5: Demographic similarity is not a sufficient condition for stable coalition formation. Rather, demographic similarity leads to stable alliance patterns only when power is centralized and the use of politics is high.*

Effects of Time

Most observers of political process have paid little attention to changes over time (Stevenson et al., 1985). However, two cases gave us the opportunity to observe the effects of time and transitions on the politics of executive teams.

What we found was that stable patterns of political behavior develop slowly, but once formed, are slow to change. Like a river, politics can take an almost random early course, following the convenient paths offered by adjoining offices, prior experience together, and so on. However, with time, political behavior becomes channeled into stable patterns, and like the course of a river, resistant to change. In formal terms:

> *Proposition 6: The formation of stable alliance patterns lags changes in the use of politics.*

Two cases in which there were major transitions within the top management teams provided grounds for this proposition. One case was Neutron, where we observed a top management team at the beginning of their time together. When we visited the firm, the president had been at Neutron for only six months. The VPs of sales, engineering, and manufacturing were all hired after his arrival. In fact, five of the six executives had worked for the firm for less than a year. Neutron's team was politically active, as measured by alliance scores and by anecdotal and decision-story evidence (Table 2). However, there was only one stable coalition within the team, and the variance of the alliance scores was the lowest among the politically active teams (Table 5). Thus, despite evidence that the Neutron team was politically active, the political activity was not as organized into stable alliance patterns as it was at the politically active teams at Cowboy, Alpha, and First, which had been in place for several years. We inferred that perhaps the team was so new that stable alliance patterns had just begun to emerge.

The second case was Omicron, where we observed a top management team that had recently undergone a change of CEO. At the time of our study, the current CEO had been in place for only a few months. His predecessor was viewed as a "domineering personality" with a "strong ego." Bill, the prior CEO, himself told us that he did not think that most people were even capable of thinking about strategic issues. In contrast, his successor was described as "easygoing," and "easy to work with" and as having "lots of respect for people." The power scores corroborate that he had decentralized responsibility (see Table 2). Consistent with Propositions 1 and 2, the qualitative evidence indicates that the increased decentralization reduced the team's use of politics. For example, the VP of manufacturing told us: "The politics at Omicron are becoming less and less. . . . I'm not aware of any politics lately." Another executive said: "A lot was getting decided by Bill and a few others over the weekends that ended up impacting us [the rest of top management]. Now we have more frank assessments in meetings and everyone attends." However, there was one stable coalition at Omicron, whereas there were none at the other politically inactive firms such as Zap, Forefront, and Promise, and the variance in alliance scores was the highest among the less political teams. We inferred that vestiges of past stable alliance patterns, although dissipating, still lingered.

In summary, although the four propositions in this section are tentative, they do make the case that politics, particularly in politically active teams, are organized into small and stable coalitions whose membership is based on demographic characteristics. Over time, a pattern of stable alliances emerges in politically active teams and lingers even when the conditions that triggered its rise are no longer present.

TOP-MANAGEMENT-TEAM POLITICS AND FIRM PERFORMANCE

Several authors (Daft, 1983; Pfeffer, 1981) have argued that politics can be beneficial. Moreover, those authors have argued that politics may be particularly advantageous in rapidly changing environments because they serve as an important mechanism for adaptation.

Although limited, our data indicate a different view. Among the firms we studied, the top management teams of the effective firms avoided politics, whereas the management teams of poor performers tended to use politics.[3] In more formal terms:

> *Proposition 7: The greater the use of politics within the top management team, the poorer the performance of a firm.*

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[3] There are many factors related to performance, and power centralization may be related to performance other than through politics. However, our interest is in politics and we found the politics-performance link compelling. So we have focused our attention directly on politics, rather than on these other relationships.

Performance was assessed by (1) CEOs' numerical self-reports of company effectiveness (0–10 scale), (2) that rating compared to ratings CEOs gave competitors, and (3) sales growth and profitability figures from before and after our study. Table 7 summarizes these data.

The variation in performance that emerges supports our proposition that firms with politically active top management teams perform less well. For example, Alpha's performance did not live up to its president's expectations. Sales were declining, and the firm was only marginally profitable. First was a moderate performer, with low growth and modest profits. And Neutron and Cowboy were no longer in business. Neutron closed its doors as a result of bankruptcy, and Cowboy ran out of money because of delays in its new product line.

By contrast, Zap's performance was spectacular, with sales growing at 25 to 100 percent per quarter. Forefront was also a strong performer, with sales tripling and after-tax profits at 9 percent during the year of our study. Since the study, the firm has gone public. When we studied Omicron, the firm was in a turnaround situation, and in transition with a new president (cf. Bourgeois & Eisenhardt, 1987). We found evidence of reduced use of politics with the new president, and the firm has since rebounded, with 50 percent sales growth and 6 percent after-tax profitability. Although it is still too early to gauge Promise's performance on strictly financial grounds, the president gave them a high self-rating, they have received strong support from the venture capital community (over $15 million), and their order backlog is strong.

Why are politics linked with poor firm performance? The threat-rigidity literature claims that poor performance is likely to trigger power centralization, which we have argued leads to politics. These linkages suggest that poor performance creates politics. The data from Neutron are consistent with this line of reasoning. The new CEO at Neutron was hired to "take charge" of the weak firm. Our data indicate that he centralized power, and the team became politically active.

However, our data also make a case for the opposite (but not mutually exclusive) causal direction: politics lead to poor performance. The qualitative data indicate several reasons why politics limit firm performance. One reason is that it is time-consuming to engage in politics. Politics distract executives and dissipate their energy. The executives we studied are very busy people, and using politics means that they are taking time away from their functional responsibilities. For example, the VP of marketing at First spent extensive time lobbying the president and arranging presentations by external consultants in order to convince the chairman to delay his decision. He felt that he could not be effective by simply going to the chairman with his case. As he told us: "I would just have been labeled a foot-dragger." Not only was this political activity time-consuming, it also kept him from important marketing tasks. The firm had introduced a major new product line. The product was being distributed through multiple channels that competed with one another. Several distributors had begun to impinge on others'

TABLE 7
Firm Performance

Firm	CEO's Rating of Firm Performance	CEO's Ranking of Firm Relative to Competitors	1984 Sales[a]	1983–84 Sales Trend	1984 After-Tax Return on Sales	Examples	1985 Performance[b]
First	7	2 of 4	20,000	Flat	4%	Not really good performance for the computer industry (VP, finance).	Flat: No change in sales or profitability
Alpha	5	5 of 6	10,000	Down	−1	Disappointing (VP, operations).	Mixed: Sales dropped 1%, raised profitability to 3.5%
Cowboy	5	4 of 6	10,000	Down	−49	We ran out of time. We ran out of money (VP, manufacturing).	Dead: Closed doors
Neutron	5	3 of 5	30,000	Flat	−31	Puberty has been rough (VP, marketing).	Dead: Chapter 11
Omicron	5.5	4 of 6	30,000	Flat	−9	It's put up or shut up time (VP, human relations).	Turnaround: 50% sales increase, raised profitability to 5.9%
Promise	6	2 of 7	1,000	Up	−1,280	Struggling to be great (VP, finance).	Promising: 500% sales increase, losses trimmed
Forefront	9	1 of 4	30,000	Up	9	We are right on plan (president).	Strong: Initial public offering
Zap	9	2 of 6	50,000	Up	8	Right on the money (VP, sales).	Strong: 50% sales increase, initial public offering

[a] The sales figures are × $1,000 and rounded to preserve anonymity.
[b] Post-study.

territories, and price wars were developing. The politicking of the VP of marketing limited the time available for him to perform his regular job.

A second reason is that politics restrict information flow (Pettigrew, 1973). Such restriction is particularly problematic in high-velocity environments, where strategic decisions must be made quickly and rationally (Bourgeois & Eisenhardt, 1987, 1988). In such environments, a premium is placed on timely and accurate information. Yet politics, by their very nature, often impede the flow of information (Pettigrew, 1973). For example, in the decisions we studied, both the president of Neutron and the chairman of First withheld information that a decision was occurring. In the case of First, the idea of changing the name of the firm arose over a year before the final decision. Although the VPs thought the issue had been dropped, the chairman continued to consider the change privately. As one executive said: "The decision had gone underground." The chairman brought the issue up again only three weeks before the final decision was made, thereby limiting opposition. The president of Neutron also limited information about his considering an alliance with another firm. These actions constrained discussion of the issues, and Neutron eventually went bankrupt. Executives at Alpha, another politically active team, were described as "secretive" and "close to the vest" by their colleagues. One VP described how another bypassed him by only sharing information with the president: "Rich [VP of sales] was trying to get Don's ear, and since I had been close to Don for a long time, he would skip me." The result was that the VPs had poor information from other functional areas. Particularly problematic was the new-product-development interface between sales and R&D. Rather than share information, the VPs of the two areas withheld information from one another as they jockeyed for position in the "pecking order."

The stability of alliances in politically active teams also distorted perceptions about the opinions of others. For example, as described earlier, executives at Alpha failed to develop natural, issue-based, alliances with executives in different coalitions. The VP of R&D, who was in one coalition, thought that the VP of sales, in another coalition, favored development of an IBM-compatible product. Yet, the VP of sales expressed complete opposition to an IBM-compatible product to us. Overall, the executives in the politically active teams were often incorrect in their perceptions of others' opinions, thereby limiting their ability to form effective alliances. Descriptions of poor communication made by several executives from these teams corroborate this observation. For example, we were told: "He [the chairman] doesn't really listen to me," and "The group wasn't really hearing what I was saying." In contrast, the executives at Zap, Omicron, Forefront, and Promise had a much better understanding of the views of others. For example, the executives at Zap could accurately describe the varying positions held by others on whether the firm should go public. Promise executives could also accurately articulate the positions of others on the issue of strategic redirection that we studied.

Events at Omicron, where there was a change in CEO followed by a reversal in performance, make a strong case for the effects of politics on performance. Colleagues described the prior CEO as "domineering." In contrast, the new CEO was seen as "easygoing" and "people-oriented." Our quanitative data confirm the power-sharing of the new CEO (Table 2). Consistent with Proposition 1, several of the VPs confided to us that the team was less political under the new CEO, and our quantitative data indicated a team in transition, becoming less prone to use politics with time. At the time of our study, the firm had stagnant sales and was losing money. In the year after our study, the firm, with its new power-sharing CEO and less political team, increased sales 50 percent and became profitable. In this case, diminished politics preceded a financial turnaround.

Overall, the best-performing firms were those in which the CEO shared power with the functional VPs and politics were minimal. For example, Zap was a star in the microcomputer industry. The president of Zap had relinquished much of his power to strong functional heads. Zap executives, in return, saw no need to engage in politics. As one VP told us: "I've made my position known." Although this lack of politics was probably not the only reason for Zap's success (Eisenhardt, 1988), it seems an important factor. Similarly, Forefront was also a successful firm. Like Zap, Forefront had an empowered top management team and limited political activity among its top management. Again, there was little time to waste on alliances, outlaw staff meetings, and other forms of political behavior. As one executive told us: "We're not political."

Proposition 7 expresses a more negative view of politics than that of some authors (Baldridge, 1971; Pfeffer, 1981). Our results may differ because our definition of politics differs (Gandz & Murray, 1980). Ours is a focused definition grounded in the data from our informants. Another reason may be the stability of the alliance patterns we found in our cases. We simply did not find the shifting, fluid alliances others have described (Baldridge, 1971; Gamson, 1964). The absence of shifting alliances undermines the adaptation argument (Daft, 1983; Pfeffer, 1981). We found that the stress of political cultures and the satisficing behavior of executives seem to lead to stable alliance patterns.

A final reason for the differences in results may be related to environment. The microcomputer industry is a high-velocity environment, characterized by rapid and discontinuous change (Eisenhardt & Bourgeois, 1989). At the time of our study (1984–85), the industry had existed for only seven years (Apple Computer was founded in 1977). Between 1980 and 1985, there were major changes in technology, including the advent of the UNIX and DOS operating systems, 32 bit microprocessors, and RISC architecture, and major changes in competitive positioning—IBM and DEC entered and Texas Instruments and Sinclair left. We have argued elsewhere that it is crucial both to move rapidly and to avoid mistakes in such an environment (Bourgeois & Eisenhardt, 1987, 1988). However, our evidence suggests that firm politics make it difficult to achieve either of those goals. Politics create rigid barriers to communication and slow down the pace of decision making. In contrast, the large and stable bureaucracies studied by others (Baldridge, 1971; Pfeffer & Salancik, 1974) may afford the time to engage in assessment of preferences and in fluid political patterns, and they may be more forgiving of poor judgments.

TOWARD A MIDRANGE THEORY OF POLITICS IN HIGH-VELOCITY ENVIRONMENTS

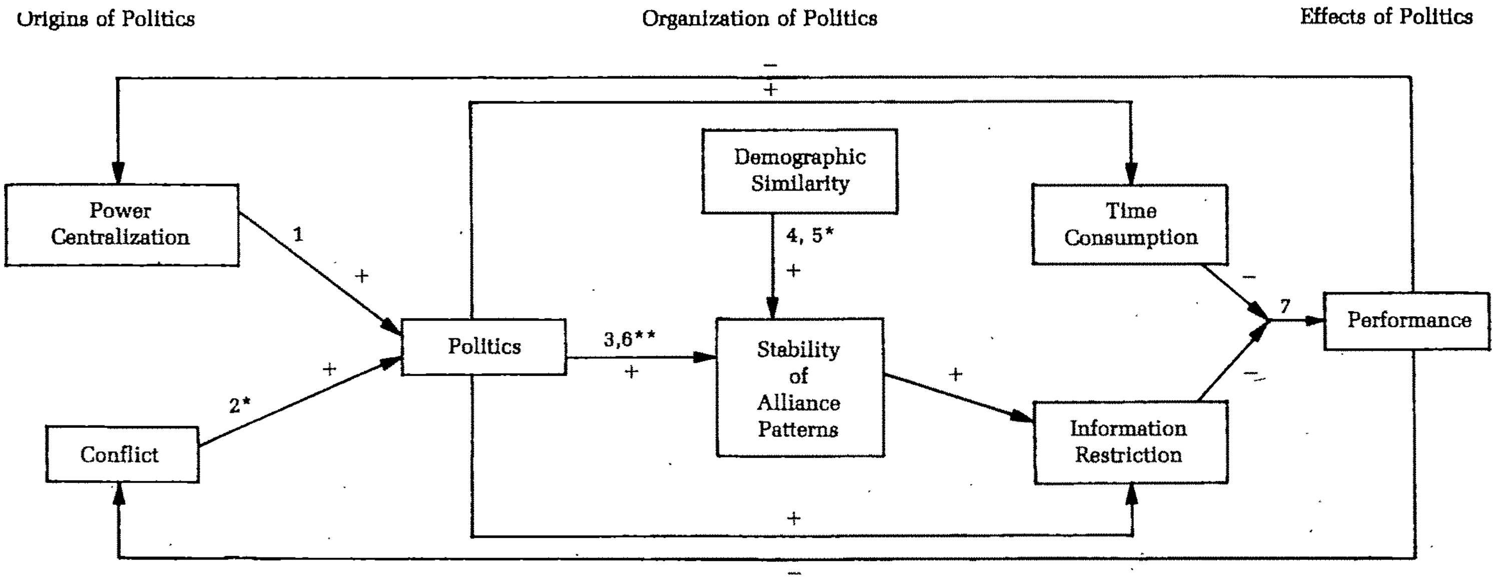
Our initial goal was to enhance understanding of how politics operate when top management teams make strategic decisions. The overall result of our work was a model of the politics of strategic decision making in high-velocity environments, depicted in Figure 1. The rationing of power by autocratic CEOs, combined with the desire for control by frustrated top management teams, is an impetus for politics (Proposition 1). The CEOs preserve their power through the use of politics, and the other members of the teams attempt to gain power through politics of their own. In contrast, when the power of a CEO is decentralized and the other members of a team are empowered, most executives see little need to engage in politics. Rather, open, forthright conflict is the norm, with the CEO and possibly the relevant VP resolving stalemates. Thus, although conflict may be necessary, it is not a sufficient condition for the emergence of politics (Proposition 2).

We also found that politics are organized around stable coalitions (Proposition 3). Rather than being organized as shifting issue-based alliances, politics in our teams were organized around small and stable coalitions whose membership was not based on issues but on demographic characteristics such as age, job title, and office location (Proposition 4). Demographic characteristics were not causal (Proposition 5), but rather seemed to provide a convenient alliance basis for executives caught up in the stress of political environments and the pace of high-velocity environments. Such stable patterns of alliances were particularly disruptive because communication within the executive teams was seriously impaired. We also found that the development of strategic coalitions lagged changes in power centralization and the use of politics (Proposition 6).

Finally, the use of politics is related to diminished firm performance (Proposition 7). The firms with politically active teams exhibited slow growth and low profitability. Our cases suggest that politics are time-consuming and information-restricting, creating communication barriers and inflexibility within a team. These negative effects are probably exacerbated in the fast-paced industry that we studied. Thus, the use of politics in high-velocity environments is associated with diminished firm performance.

As presently constituted, this model provides the rudiments of a midrange theory of political behavior among top managements, explaining relationships between variables in a particular setting: high-velocity environments. To the extent that our results are valid and can be supported by data from other

FIGURE 1
A Model of the Politics of Strategic Decision Making in High-Velocity Environments[a]



[a] Numbers correspond to propositions in the text.
* Refers to necessary, but not sufficient, conditions.
** Refers to propositions involving a time lag.

research settings, we think that a theory of power and politics in top management teams is possible and that such a theory could inform a more general political theory of organizations.

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APPENDIX

Several variables were measured with a questionnaire. The goal and policy-conflict questions were derived from Bourgeois (1980). The questions on interpersonal disagreement, alliance formation, and power were derived from Hinings and colleagues (1974), as modified by Astley (1978).

The questionnaire was introduced to each respondent during the course of an interview. We had the respondents go through two or three questions in order to ensure that they understood the intent of each question and the numerical rating system we were using. For example, the questions about disagreements and alliances were introduced with the commentary that "conventional wisdom holds that a decision climate of harmony and consensus is ideal, but the empirical evidence doesn't necessarily support this. In fact, some people feel that healthy debate and open conflict is more effective to decision making." The purpose of this introduction was to diminish social desirability bias.

Conflict

There were two questions on the importance of different goals and strategic decision areas. Conflict was assessed as the variance within each top management team.

Goal conflict. The goal question consisted of a list of ten organizational goals. The question read: "In the space provided, indicate how important each of these goals is to your firm" (0–10 scale). The goals included long-term profitability, growth, innovation, stock price, company prestige, and service to the community. We computed goal disagreement by summing the top management team's standard deviation on each of the goal items.

Policy conflict. Our questionnaire contained a matrix in which 12 key decision areas were listed down one side of the sheet and the firm's executive titles were listed across the top. The question was: "Here is a list of various decision areas which may be of strategic importance to your firm. Please indicate how important each of these decision areas is to the long-run health of your firm" (0 = not at all important, 10 = extremely important). The decision areas included marketing strategies and product pricing, R&D project selection, expansion of production capacity, major financing (e.g., issuing stocks or bonds), and restructuring the organization. We computed policy disagreement by summing a team's standard deviation on each of the items.

Interpersonal disagreement. In order to obtain interpersonal disagreement scores for each top management team, we asked each executive to evaluate frequency of disagreement with each specific other member of the team. The question was, "How often, during the process of deliberating, debating and making policy decisions, have you found yourself in open disagreement with the suggestions or proposals of each of these individuals?" (0 = never, 10 = constantly). We first computed the mean score for each executive and then the overall mean for the team.

Power

Using the same key-decision-area matrix described under "policy conflict," executives rated each manager on their influence on each decision: "Now, for the same list of decision areas (excepting those scored 0 or 1), indicate how much influence you think each manager has in making decisions concerning that decision area. If the manager has a very great deal of influence over the decision area, give a rating of 10, no influence would score 0, and so on." Power scores for each executive were computed by taking the mean scores assigned to the executive by every other respondent. We took three steps, computing (1) a mean power score for each person on each decision, (2) a mean score for each decision area (R&D, marketing, finance, operations, organization), and (3) an overall mean.

Alliance Formation

Executives were given a list of their colleagues on the team and asked to indicate the frequency (0 = never to 10 = constantly) with which they formed alliances with each colleague. The question was: "How often have you had to join forces with and form an alliance with each manager in order to influence or 'push through' a policy proposal, or to get your alternatives or points of view 'on the table' ?" We obtained each team's score in two steps, computing (1) the mean for each executive and (2) the mean of each of those means. We also constructed network diagrams of the alliance patterns of each team by taking the mean alliance score between each pair of executives and used those means to determine the stable coalitions. Finally, we computed the variance in the alliance score as a measure of alliance stability.

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DIVERSITY, DIVERSIFICATION, AND PROFITABILITY AMONG BRITISH MANUFACTURING COMPANIES, 1972–84

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This study investigated the causal relationships between diversity, diversification, and profitability among 304 large British manufacturing companies that differed in both product and multinational diversity. Diversity and profitability were positively related up to a point; after that point, increases in product diversity were associated with declining profitability. The results were unclear with respect to the underlying causal relationships. Product diversification did not increase profitability, and there was limited evidence that profitability promoted diversification. For multinational diversification, however, we found that profitability in the home market encouraged overseas expansion that in turn increased profitability.

Since Rumelt's (1974) pioneering study, the relationship between corporate diversification and firm performance has attracted more attention than any other area of strategic management research. Yet, despite a burgeoning empirical literature, no consensus has emerged as to the impact of diversification on performance—indeed, recent studies have increased the inconsistencies between the findings of different researchers. A major motive for our research was our belief that the failure of empirical research to make more substantial progress in revealing the relationship between diversification and performance has been due in part to weaknesses in the methodology and data of prior studies.

The principal contributions of our study to understanding the relationship between diversification and performance are improved methods and new data. Prior studies have either been agnostic as to causation or have presumed performance differentials to be outcomes of the diversification strategies adopted. Our study considered alternative directions of causation in the relationship of performance and diversification. A second weakness of

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previous studies has been their focus on static relationships, with the result that they have been of limited value as a basis for drawing normative conclusions for the conduct of corporate strategy. The key issue for managers is not whether diversified firms are more profitable than specialized firms, but whether diversification increases profitability. We distinguished between *diversity*, which measures the spread of a company's activities at a point of time, and *diversification*, which measures increases in diversity over time, and estimated both dynamic and static relationships. A further feature of our methodology is that we critically examined the Wrigley-Rumelt categorization of diversification strategies (Rumelt, 1974; Wrigley, 1970), the measure of corporate diversification used in most prior studies, by comparing its explanatory power with that of a quantitative index of product diversity. This study also encompassed a broader concept of diversity than prior studies by considering both product and multinational diversity.

Finally, most prior studies have used U.S. data, many of them using the same sample of firms as Rumelt's original study. Our data set was new: it comprised 304 British manufacturing companies and covered the period 1972 to 1984. This was the first large-sample, multivariate analysis using British data.

FINDINGS OF PREVIOUS RESEARCH

Empirical research into diversification and performance has investigated cross-sectional relationships, typically among groups of 40 or more firms. Table 1 summarizes the key features of the main studies.

The primary emphasis of previous empirical research has been associating profitability differentials with different diversification strategies. Rumelt (1974) set the pattern for subsequent research by developing a taxonomy of diversification strategies. He found that related diversification was associated with a higher profitability than was unrelated diversification and that the more narrowly focused related-constrained diversification was more profitable than the looser related-linked diversification. Berry (1975) supported those results, finding that diversification across four-digit Standard Industrial Classification (SIC) codes was positively related to firm performance and that broader-spectrum diversification across two-digit SIC codes was negatively related to performance.[1]

Subsequent studies have used multivariate analysis to separate the impact of diversification strategy from other influences on corporate performance. Christensen and Montgomery (1981) and Bettis and Hall (1982) showed that the differences in profitability between strategic categories that Rumelt observed could be attributed mainly to industry effects. In a subse-

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[1] Studies in the finance literature have further confirmed the poor performance of unrelated diversification. Those studies have shown that, whether measured by accounting returns or returns to shareholders, conglomerates performed either no better than, or significantly worse than, control groups of nonconglomerates (Mason & Goudzwaard, 1976; Melicher & Rush, 1973; Weston, Smith, & Shrieves, 1972).

TABLE 1
Empirical Studies of the Relationship Between Diversification and Firm Performance

Study	Sample	Findings
U.S. studies		
Weston et al. (1972)	48 conglomerates and 50 mutual funds, 1960–69	Conglomerates showed higher security returns but were less effective at diversifying risk than mutual funds.
Melicher & Rush (1973)	45 conglomerates and 45 nonconglomerates, 1966–71	No significant differences between the two groups in either ROI or security returns.
Rumelt (1974)	500 industrial companies, 1949–69	Dominant-constrained and related-constrained companies most profitable; single and dominant vertical firms had low growth in sales and earnings; acquisitive conglomerates had high growth in sales and earnings.
Berry (1975)	460 industrial companies, 1960 and 1965	Growth of assets positively related to change in four-digit SIC index of diversity and negatively related to change in two-digit SIC index of diversity.
Mason & Goudzwaard (1976)	22 conglomerates and a matched sample of 22 portfolios of specialized firms, 1962 and 1967	ROA and equity returns higher for the control sample than for the conglomerates.
Biggadike (1979)	68 diversifying ventures by 35 large corporations	New ventures require an average of 7 years before reaching profitability.
Christensen & Montgomery (1981)	128 *Fortune* 500 companies, 1972–77 (subsample of Rumelt, 1974)	Dominant-constrained, dominant-linked, and related-constrained firms most profitable; vertically integrated firms least profitable. High performance of related-constrained firms due to location in profitable, growing, concentrated markets. Unrelated firms were located in stagnant, unprofitable, unconcentrated markets.
Bettis (1981)	80 *Fortune* 500 companies, 1973–77 (subsample of Rumelt, 1974)	Related-constrained firms more profitable than unrelated, owing primarily to the impacts of advertising, R & D, risk, and capital intensity.
Bettis & Hall (1982)	Same as Bettis (1981)	Higher profitability of related firms due to the presence of four pharmaceutical companies in the related group.
Rumelt (1982)	273 *Fortune* 500 companies, 1955–74 (extension of Rumelt, 1974, sample)	Related-constrained firms earned ROA > average; dominant-vertical and unrelated-business firms earned ROA < average. After adjustment for industry effects, single-business and dominant-constrained firms earned ROA > average; unrelated firms earned ROA < average.

TABLE 1 (continued)

Study	Sample	Findings
Stubbart & Grant (1983)	90+ large divisionalized companies	Dominant-constrained and related-constrained firms showed highest ROI, ROE, and sales growth.
Michel & Shaked (1984)	51 companies from the *Fortune* 250, 1975 and 1981	Unrelated diversifiers earned higher risk-adjusted equity returns than related diversifiers.
Palepu (1985)	30 food products companies, 1973–79	Related diversifiers earned higher return on sales than unrelated diversifiers.
Dolan (1985)	80 *Fortune* 500 companies	After adjustment for industry effects, unrelated firms earned higher ROE but had lower valuation ratios.
Montgomery (1985)	Same as in Christensen & Montgomery (1985)	An SIC-based measure of diversity was insignificantly associated with ROI once industry structure, industry profitability, and market share were taken into account.
Rajagopalan & Harrigan (1986)	Same as in Bettis (1981), data for 1978–80.	Equity returns and risk-adjusted accounting returns insignificantly different between Rumelt categories.
Varadarajan & Ramanujam (1987)	225 companies, 1980–84	Related diversifiers earned significantly higher ROE and ROI than unrelated diversifiers.
Dubofsky & Varadarajan (1987)	Same as in Michel & Shaked (1984)	Confirmed Michel & Shaked's finding that unrelated diversifiers earn higher risk-adjusted equity returns than related diversifiers, but showed no difference in ROA.
Non–U.S. studies		
Grinyer, Yasai-Ardekani & Al-Bazzar (1980)	48 large U.K. companies, early 1970s	Differences between strategy categories mainly insignificant. Only dominant business firms earned a higher ROI.
Itami et al. 1982	112 large Japanese companies, 1963–73	After size, industry growth, concentration, and R & D accounted for, dominant-constrained firms earned higher ROI with lower earnings variability
Lecraw (1984)	200 large Canadian manufacturing firms, 1961–75	ROE significantly higher for related-diversified and vertically integrated firms.
Luffman & Reed (1984)	439 U.K. companies from the Times 1000, 1970 and 1980	Unrelated and dominant companies earned higher equity returns than related and single-business firms; unrelated diversifiers had highest growth in sales and ROC.
Buhner (1986)	40 large, diversified German firms, 1966–81	Weak positive correlations between risk-adjusted equity returns and both product and geographical diversity.

quent study, Montgomery (1985) found diversity to be unrelated to profitability when industry and market-share variables were controlled for. However, in updating his earlier study, Rumelt (1982) confirmed that, even after adjustment for interindustry differentials, related-constrained diversifiers earned the highest returns on assets.

Several studies using more recent data have found that unrelated diversification serves firms as well as, if not better than, more focused strategies. Michel and Shaked (1984), who used returns to stockholders, and Dolan (1985), who used accounting returns, both observed that unrelated diversifiers outperformed other strategy types, and Rajagopalan and Harrigan (1986) found insignificant differences in accounting and stockholder returns between the Rumelt categories. Dubofsky and Varadarajan (1987), replicating Michel and Shaked's (1984) study, confirmed the superior stock-market performance of unrelated diversifiers but found no significant differences in accounting returns. Although Michel and Shaked's and Dubofsky and Varadarajan's studies adjusted for risk, they did not take industry effects into account.

Findings concerning relationships between diversity and profitability appear to be highly susceptible to choices concerning profitability measures, time period, control variables, and method of analysis. Yet inconsistency of results has done little to inhibit researchers and consultants from offering general guidance to managers on the conduct of diversification strategy.[2] Since managers want more than the oversimplified maxims some consultants offer, and theory points to the existence of general relationships between diversification and performance, there is a strong case for extending the field of research beyond the samples of U.S. *Fortune* 500 companies that Rumelt and most other researchers have studied.

Outside the United States, very few studies have used multivariate analysis on large samples.[3] Similarities between the United States and Britain in industry structure, financial markets, and management methods make use of British data a natural extension of U.S. research. We anticipated that British data might shed new light on the inconclusive findings of U.S. studies. The only extant large-sample British study (Luffman & Reed, 1984) was methodologically flawed in so far as the data covered only two years (1970 and 1980) and the analysis was univariate with no allowance made for determinants of performance other than diversification.

HYPOTHESES

Our starting point for generating testable hypotheses concerning the relationships between diversity, diversification, and profitability was the economic theory of organization (Alchian & Demsetz, 1972; Teece, 1980; Williamson, 1975, 1979, 1981). On the basis of some plausible assumptions concerning transaction and information costs, managerial motivation, and economies of scope, we derived five hypotheses, four concerning the impact of diversity on profitability and one concerning the impact of profitability on diversification.

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[2] For example, on the basis of both their own observations and their interpretation of the research findings of others, Peters and Waterman coined their "golden rule" of excellence: "Stick to the knitting" (1982: 294).

[3] Exceptions are the studies by Itami, Kagono, Yoshihara, and Sakuma (1982), Lecraw (1984), and Buhner (1986).

A major organizational consequence of diversification is the increased importance of a corporation's head office. When firms are specialized by industry, resource allocation occurs through the interactions between firms and the suppliers of resources in the markets for those resources. Within a diversified firm, corporate management allocates resources between divisions and, hence, between industries. Also, the managers of operating divisions are responsible to a corporate head office that occupies an intermediate position between senior operating managers and shareholders. Williamson (1979, 1981) argued that the internalization of transactions and control within diversified companies generates efficiencies through two main sources.

First, the allocation of resources between business units by a corporate head office can avoid the costs specialized firms incur in using the markets for capital, labor, and other resources. In particular, diversified firms can make better resource allocation decisions than can firms relying on resource markets because corporate managers have superior access to information on the productivity of individual factors of production than managers relying on the market have (Alchian & Demsetz, 1972). Second, the separation of strategic and operational control in diversified firms may permit them to overcome some of the agency problems that afflict large management-controlled corporations:

> Since the general management of an M-form conglomerate is disengaged from operating matters, a presumption that the general office favors profits over functional goals is warranted. Relatedly, the general office can be regarded as an agent of the stockholders whose purpose is to monitor the operations of the constituent parts. Monitoring benefits are realized in the degree to which internal monitors enjoy advantages over external monitors in access to information (Williamson, 1981: 1639).

Hence, since all large, diversified U.K. firms have divisionalized structures (Channon, 1973), we predicted that internalization efficiencies would offer cost advantages to diversified firms.

> *Hypothesis 1: Diversified firms are more profitable than specialized firms.*

At the same time, internal governance is neither costless nor frictionless. One consequence of increasing diversity may be disproportionately rising costs of administration and increased inflexibility. Diversification, by creating an additional level of corporate management to control and coordinate operating units, not only imposes increased administrative cost but may cause inefficiencies arising from lack of adaptability to environmental change, politicization of strategic decision making, and strain on top management as the corporate center seeks to manage an increasing number and diversity of businesses.[4] Decentralization through divisionalized corporate structures may only partially mitigate some of those inefficiencies.[5]

> *Hypothesis 2: Profitability declines exponentially with increasing diversity.*

The relative costs and benefits of corporate diversity are likely to depend on how the different business activities of a firm are related to one another. Where separate business activities use a common, indivisible input, a diversified firm can exploit *economies of scope*. Economies of scope arise not just from tangible inputs like a common R&D department or a common distribution system but also from intangible assets like brand names and production know-how, the use of which may be transferable at a negligible marginal cost.[6] The potential for exploiting economies of scope depends crucially on the closeness of the relationships between a firm's businesses. In the case of product scope, a firm whose different product divisions are linked by common customers, distribution channels, or technologies will have greater potential for exploiting economies of scope than a diversified firm where such links are absent. It also seems likely that firms can more readily exploit economies of scope in intangible, firm-specific assets such as technological innovations, brand reputation, and production know-how through multinational diversification than through product diversification. That is, deployment in a single industry in different countries will be more successful than deployment in different industries.[7]

> *Hypothesis 3a: Concerning product scope, related diversity is more profitable than unrelated diversity.*
>
> *Hypothesis 3b: Multinational diversity is more profitable than product diversity.*

It is also likely that the trade-off between the costs and benefits of diversity changes over time. It seems plausible that technological change has the effect of reducing the costs of internal organization relative to the costs of market organization. Just as the development, initially by General Motors and Du Pont, of the divisionalized corporation greatly facilitated the management of diversified firms, so subsequent advances in organization, management systems, and decision-making techniques have continued that process. Critical administrative developments have included innovations in strategic planning techniques associated with General Electric, Profit Impact of Market Strategy (PIMS), and the Boston Consulting Group, new approaches to financial monitoring and control pioneered by companies such as ITT in the United States and Hanson Trust in Britain, increased administrative efficiency through technological advances in information processing and telecommunications, and learning-by-doing in the management of acquisitions. Dundas and Richardson (1982) observed that although conglomerate firms performed poorly during the 1970s, firms that, over time, developed small, focused corporate head offices with sound and simple internal controls and clear criteria and procedures for acquisitions stood out as strong performers. Hence, improved corporate management of diversified enterprises implies that, over time, diversified firms become more efficient than comparable specialized firms.

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[4] Increasing cost and inefficiency may be partly a consequence of diversity per se and partly a result of the increasing firm size associated with diversity. Williamson (1967) argued that increasing firm size necessitates the addition of levels to a management hierarchy, with consequent distortion of information, loss of control, and increase in administrative costs.

[5] Mintzberg (1979: 380–430) argued that divisionalization increases bureaucracy within divisions, may create conflict between corporate and divisional managers, and may reduce overall corporate profitability by encouraging the subsidization of unprofitable divisions by profitable ones.

[6] In fact, as Teece (1982) argued, economies of scope are not a sufficient condition for diversification to be profitable. In addition, there must be transaction costs that make it unprofitable to exploit economies of scope by selling the services of a common resource to another firm.

[7] See Caves (1971, 1982).

> *Hypothesis 4: Over time, diversified firms increase their profitability relative to that of specialized firms.*

Our presumption so far has been that causation flows from diversity and diversification to performance. It is also likely that profitability influences diversification. Again, predictions based on a priori analysis are ambiguous: on the demand side, low prospects of future profitability in existing activities might be expected to create incentives for diversification; on the supply side, high profits from existing activities can be used to finance diversification.[8] Empirically, those alternative predictions may be less conflicting than they initially appear. Low-growth industries like the tobacco and oil industries typically offer both high returns on existing capital and poor returns on new investment. Since our interest was in testing hypotheses, our emphasis was on observable rather than expectational variables. Consequently, our final hypothesis focuses on the prediction that current profitability, measured in terms of cash flow, promotes diversifying investment.

> *Hypothesis 5: Profitability encourages diversification.*

Figure 1 summarizes our assumptions concerning intervening organizational and market processes and our hypotheses concerning the relationships between diversity and profitability.

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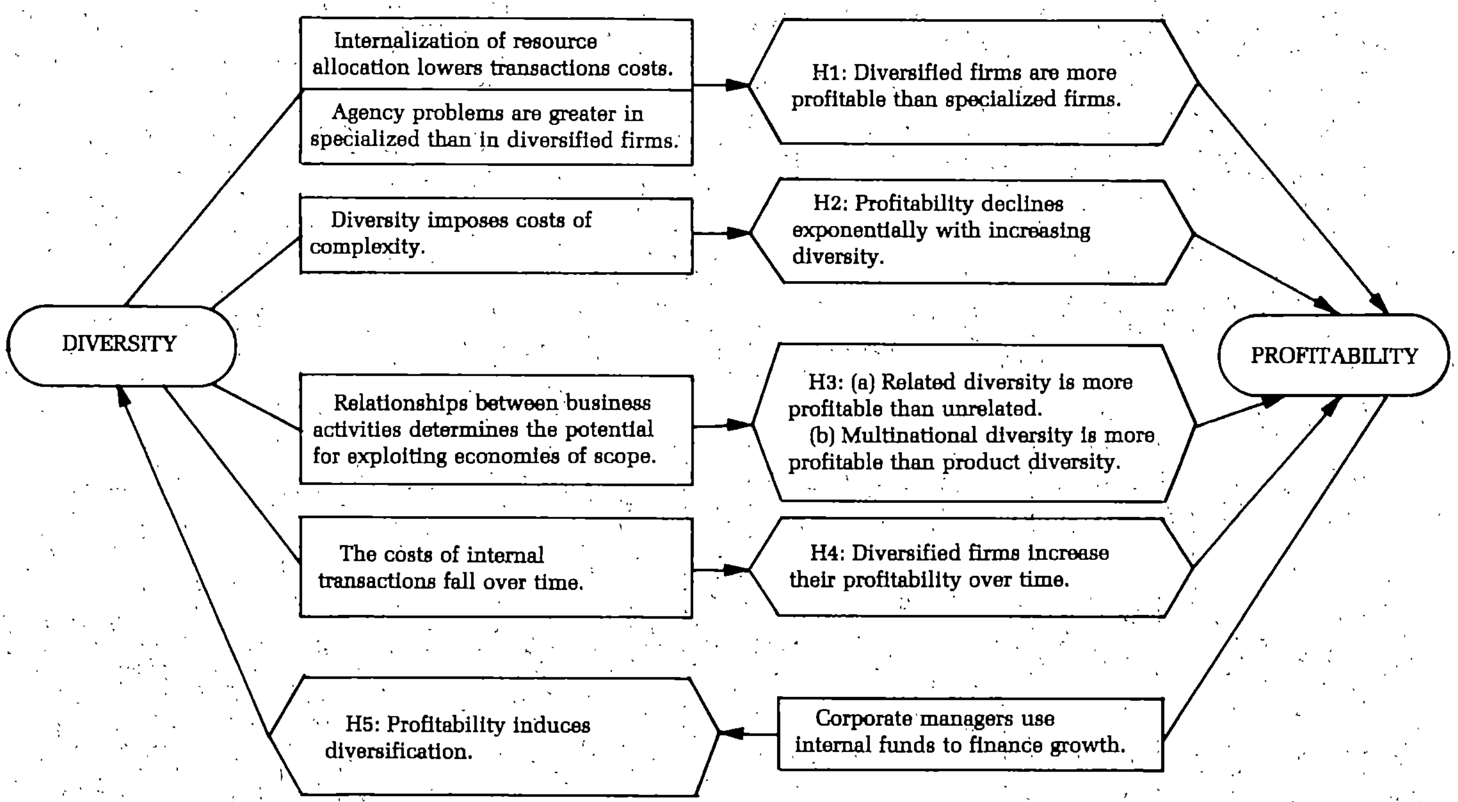
[8] Nickell (1978: 262–264) discussed the influence of internal generation of funds on level of corporate investment. He showed that the availability of internal funds for less capital than external funds speeds the rate at which a firm adjusts its capital stock. Coen (1971) confirmed this effect empirically.

FIGURE 1
Predicted Relationships: A Summary of Assumptions and Hypotheses[a]


DIVERSITY
Internalization of resource allocation lowers transactions costs.
Agency problems are greater in specialized than in diversified firms.
H1: Diversified firms are more profitable than specialized firms.
Diversity imposes costs of complexity.
H2: Profitability declines exponentially with increasing diversity.
Relationships between business activities determines the potential for exploiting economies of scope.
H3: (a) Related diversity is more profitable than unrelated.
(b) Multinational diversity is more profitable than product diversity.
The costs of internal transactions fall over time.
H4: Diversified firms increase their profitability over time.
H5: Profitability induces diversification.
Corporate managers use internal funds to finance growth.
PROFITABILITY

[a] The rectangular boxes summarize the assumptions made about the influence of intervening variables. The hexagonal boxes summarize the hypotheses concerning the relationships between diversity and profitability. The arrows show the predicted direction of causation.

METHODS

The Companies Studied

The data set was compiled by eliminating nonmanufacturing, unlisted, and foreign-owned companies from the *Times 1000* compilation of the largest U.K. companies in 1974. The resulting group of 304 companies included most of Britain's largest companies—the principal exclusions were service companies, notably retailers, banks, and insurance companies; oil companies; and several state-owned corporations. Restricting the data set to manufacturers facilitated comparisons of diversity and of accounting profitability.[9]

Our study period, 1972–84, was determined first by the availability of computerized company-accounts data. Second, we wished to study a period long enough both to allow short-term influences on firm profitability to average out and to allow observation of the long-term impact of diversification on profitability.[10]

Missing data reduced the number of observations available for most of our analyses to between 230 and 262 firms, although for one regression equation only 151 firms could be analyzed. Missing data were a consequence either of the deaths of firms during the period, usually owing to acquisition, or of firms' failing to report divisional sales and profits. For purposes of comparability over time and across regression equations, we would have preferred a fixed group of those firms for which full data were available. However, a consequence of that would have been a drastic reduction in degrees of freedom, which would have limited the use and results of multivariate analysis and excluded many of the most active diversifiers.

The exclusion of firms that did not survive the period was a potential source of bias to our results. Moreover, if disappearance during the period represented failure due to choice of strategy, important evidence was lost by examining survivors only. However, inspection of the excluded firms showed that their profitability was not significantly below that of the survivors and that their principal characteristic was relatively small size.[11]

The Measures of Diversity

Diversity is the spread of a firm's activities across markets. We used three measures of corporate diversity. (1) We allocated each firm to one of

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[9] The accounting conventions used by banks, insurance companies, and oil companies were significantly different from those employed by manufacturing companies. In addition, there were substantial differences among service companies in their disaggregation of financial data by business activity.

[10] Our main findings were not sensitive to changes in the beginning and ending years. However, the shorter the time period chosen, the lower was the explanatory power of our regression equations and the less significant were our diversity variables. Hence, we present results only for the longest period for which data were available, 1972–84.

[11] Of the 304 firms present in 1974, 43 were no longer in existence as independent quoted companies by the end of 1984. Of those , 36 had been acquired. During the period 1972–75, the average *ROA* of the surviving firms was 18.10 percent and that of the nonsurvivors was 15.80 percent. The difference was not significant at the 0.05 level.

Rumelt's strategic categories, using the classification system he devised (Rumelt, 1974). Firms were classified into eight categories of corporate strategy according to the extent of their product diversity and the relationships between their different activities. (2) We devised a quantitative *index of product diversity* (*PDIV*), a Herfindahl-type measure (Hirschman, 1964) based on the share of a firm's sales in each industry group. The index is similar to the diversification index used by Berry (1975). (3) We devised an *index of multinational diversity* (*MDIV*), which measured diversity as the proportion of a firm's revenue derived from operations outside the United Kingdom.

The chief merit of the diversity indexes, *PDIV* and *MDIV*, is that they are continuous, quantitative measures that can identify and measure differences in diversity both between firms and across time. The strategic-category approach has the advantage of taking into account the relatedness of a firm's activities as well as its breadth of diversity.

In contrast to earlier researchers who have used "diversification" and "diversity" synonymously, we used diversification to mean increases in diversity over time (i.e., Δ *PDIV* and Δ *MDIV*). We referred to reductions in diversity as "specialization."

Measures of Performance

We chose pre-tax return on net assets (*ROA*) as our primary measure of firm profitability. The use of accounting return as a measure of a firm's profit performance has been a subject of considerable debate (for a summary, see Aaker & Jacobson, 1987: 283–284). Our justification for using accounting return was, first, that managers and external analysts often use return on net assets as a measure of the effectiveness and efficiency of top management; second, the impact of corporate strategy on a firm's performance is more directly reflected in accounting profit than in stock price, which measures investors' expectations about future profits. To test the robustness of our results, we also used other measures of accounting profitability, including total operating profits, return on equity, and return on sales. Those measures gave results similar to those for return on net assets, although their statistical significance was generally lower. We took measures of profitability, sales, and other financial ratios from the Extel Corporation's EXSTAT data base of U.K. company accounts for the period 1972–86. The EXSTAT data have been widely used in research (cf. Barron, 1986; Mayes, 1983).

Control Variables

To isolate the relationship between diversification and profitability, it was important to control for other variables likely to have an important impact on profitability and to be systematically related to diversification. Prior research has shown industry structure to be the most important determinant of the cross-sectional variability of firm profitability (Schmalensee, 1985). Hence, we classified firms into two-digit Standard Industrial Classification (SIC) categories on the basis of sales revenue and introduced the industry groups as dummy variables to measure industry effects. In addition, we introduced two firm structure variables: firm size and leverage. Firm size was added because of its correlation with both diversity and performance, through economies of scale and market power (Shepherd, 1975; Winn, 1977). Leverage was added as a key determinant of risk (Hurdle, 1974). We obtained firm size and leverage measures from the EXSTAT data base.

The Appendix outlines definitions and sources for the measures and the estimation process for the diversification and financial variables. Table 2 shows descriptive statistics for and correlations between the quantitative variables. Table 3 shows descriptive statistics for the categorical variables.

Statistical Analyses

Multiple regression analysis was used to distinguish the effects of diversity from the effects on profitability of other variables. To evaluate the explanatory power of the diversity variables relative to that of the other independent variables, we calculated incremental R^2s using a hierarchical regression procedure. The variables were entered in three steps, the industry dummy variables first, the firm-structure variables (size and leverage) second, and the diversity variables at the end. We conducted separate regression analyses to examine static and dynamic relationships.

Analysis of static relationships. Hypotheses 1, 2, and 3 were tested by regressing profitability on diversity while we controlled for the effects of industry, firm size, and leverage. To minimize the effects of short-term and cyclical influences on profitability, we used averages for the period 1972–84. The high degree of serial correlation in each of the independent variables over time supported our use of 13-year averages. We modeled the predictions of Hypotheses 1 and 2 through introducing the following quadratic relationship between profitability (*ROA*) and diversity (*DIV*):

$$ROA = a + b\,(DIV) + c\,(DIV^2)$$

Hypothesis 1 predicts that coefficient b is positive, and Hypothesis 2 predicts a negative sign for coefficient c. We then tested Hypothesis 3 by including product diversity and multinational diversity separately and by introducing the Rumelt strategic categories as independent variables.

Analysis of dynamic relationships. Our second set of regression equations analyzed changes over time. This dynamic analysis served two purposes. First, it allowed us to directly test Hypothesis 4, which linked diversity with changes in profitability over time, and Hypothesis 5, which linked profitability to diversification. Second, it permitted us to investigate the direction of causation in the association between diversity and profitability in order to test Hypothesis 1, positing profitability as a positive function of diversity, against Hypothesis 5, positing diversification as a positive function of profitability.

Our first set of equations regressed changes in profitability over the period on diversification over the period and the initial level of diversity. The prediction of Hypothesis 1 that profitability is positively related to diversity also implies that diversification will increase profitability over

TABLE 2
Means, Standard Deviations, and Correlation Coefficients for the Quantitative Variables

Variables	Means	s.d.	Correlation Coefficients[a]																
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1. Product diversity[b]	2.40	1.32																	
2. Product diversity[c]	2.37	1.47	92*																
3. Product diversity squared[b]	7.50	8.67	95*	87*															
4. Change in product diversity[d]	0.85	0.56	−35*	−42*	−43*														
5. Change in product diversity[e]	0.65	0.91	−29*	−30*	−31*	71*													
6. Multinational diversity[b]	0.20	0.20	07	14	09	09	06												
7. Multinational diversity[c]	0.17	0.19	12	11	13	15	15	80*											
8. Multinational diversity squared[b]	0.08	0.12	02	04	06	06	05	94*	89*										
9. Change in multinational diversity[d]	0.07	0.13	21	24*	18	−02	05	−08	−09	−15									
10. Change in multinational diversity[e]	0.05	0.12	26*	24*	25*	16	11	−02	−08	−05	62*								
11. Return on net assets[b]	16.02	5.05	07	04	06	−04	06	19	14	18	15	17							
12. Change in return on net assets[d]	−5.34	9.52	10	12	11	02	−03	13	09	10	05	12	−11						
13. Growth of sales revenue[f]	3.05	2.67	33*	36*	29*	15	10	22	26*	18	30*	34*	15	15					
14. Cash flow[b]	13.70	5.65	05	01	03	−05	−01	09	09	06	13	10	91*	09	18				
15. Log of sales revenue[b]	4.68	1.34	31*	29*	29*	−03	08	51*	52*	43*	29*	30*	12	06	−04	14			
16. Log of sales revenue[c]	4.26	1.32	38*	30*	37*	−04	03	48*	48*	46*	14	21	08	04	−07	−02	88*		
17. Leverage[b]	0.49	1.34	00	−04	00	24*	26*	17	18	18	06	02	−22	−12	14	−30*	12	15	
18. Leverage[c]	0.51	33.88	−08	−08	−06	19	20	12	16	13	01	00	−18	04	04	−35*	14	20	63*

[a] The decimal points have been omitted from the correlation coefficients.

[b] Averaged over the period 1972−84.

[c] Averaged over the period 1972−74.

[d] Change measured as the average for 1982−84 minus the average for 1972−74.

[e] Change measured as the average for 1978−80 minus the average for 1968−70.

[f] Ratio of average for 1982−84 to average for 1972−74.

* $p < 0.01$

TABLE 3
Means and Standard Deviations of the Categorical Variables

Variables	Means[a]	Standard Deviations
Rumelt categories		
Single-business	0.20	0.40
Dominant-constrained	0.07	0.25
Dominant-linked	0.10	0.30
Dominant-unrelated		
Dominant-vertical	0.07	0.26
Related-constrained	0.20	0.40
Related-linked	0.17	0.38
Unrelated	0.18	0.40
Industry groups		
Food, drink, tobacco	0.12	0.32
Chemicals	0.08	0.26
Metal manufacture	0.08	0.26
Mechanical engineering	0.28	0.45
Instrument engineering	0.01	0.12
Electrical engineering	0.08	0.26
Shipbuilding	0.00	0.00
Vehicles	0.04	0.19
Metal goods	0.04	0.20
Textiles	0.09	0.29
Leather and leather goods	0.04	0.19
Clothing and footwear	0.10	0.29
Bricks, pottery, etc.	0.01	0.08
Timber, furniture, etc.	0.01	0.12
Paper, printing	0.04	0.20
Other manufacturing	0.01	0.12

[a] Categorical variables were entered into the regressions as dummy variables. Hence the mean for each category indicates the number of firms in that category as a proportion of the total.

time, with some lag in the relationship likely. We estimated both lagged and simultaneous relationships. Prior research suggested that a four-year lag was appropriate.[12] The initial levels of diversity were included in order to test Hypothesis 4, that diversity would be related to increasing profitability over time. Industry effects, initial firm size, and initial leverage were included as control variables.

We also regressed sales growth on changes in diversity. Our suspicion here was that, if diversification was failing to generate increased profitability, it might be because growth rather than profit motivated the diversification (Marris, 1967).

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[12] Diversification occurs both by acquisition and by internal investment. In the case of acquisition, the effects on profitability typically take four to five years to be fully felt (Meeks, 1976). Where diversification involves the establishment of a new venture, the returns can take up to eight years to materialize fully (Biggadike, 1979). However, because of the influence of other factors, it was unlikely that we would be able to identify the lagged effect of diversification upon profitability beyond a four-year period.

In the second set of dynamic regression equations, we tested the alternative hypothesis that profitability was driving diversification (Hypothesis 5). Diversification over the period was regressed on cash flow from operations over the period. We considered cash flow to be the best indicator of the availability of internally generated investment funds. We also included firm size and leverage as independent variables in the belief that they would influence the availability of investment funds. We included the initial level of diversity as an independent variable on the basis that, if complexity limits diversity (Hypothesis 2), diversification would be negatively associated with initial diversity. Industry dummy variables and the initial levels of firm size and leverage were included as control variables.

Simple differences were used to measure changes in diversity and profitability. So that choices of beginning and ending years would not be unduly influential, we measured changes over the period as the difference between the average for the first three years of the period (1972–74) and the average for the last three years (1982–84).

Regression analysis employing variables measuring changes over time is a subject of some controversy. Critics have cited the use of change variables in behavioral research as a source of unreliability and bias (Cronbach & Furby, 1970; Johns, 1981). However, in industrial economics research and in strategic management research, change variables have been widely used as a means of identifying the effects of market structure and strategy on performance (e.g., Buzzell & Wiersema, 1981; Cowling & Waterson, 1976). Two problems arise in using change variables: bias arising from errors in variables is magnified, and choices as to how change is measured place arbitrary restrictions on the regression coefficients estimated. The first problem is serious for behavioral research, in which measured values may only be indicators of underlying theoretical variables. The principal source of measurement error in our variables arose from differences in firms' accounting practices. To the extent that those differences were constant over time, change data removed a major source of cross-sectional error. As to the second problem, our use of change variables imposed some restrictions but relieved others by enabling us to simultaneously examine the dynamic effects both of our static variables, the indexes of multinational and product diversity (*PDIV*, *MDIV*), and of our dynamic variables (Δ*PDIV*, Δ *MDIV*).

RESULTS

Static Relationships

Table 4 shows the results of the regression of profitability on diversity. The first equation yielded a positive association between diversity and profitability, but only multinational diversity had a coefficient significantly different from zero. The second equation revealed a clear quadratic relationship between product diversity and profitability. In the case of multinational

TABLE 4
Results of Regression of Profitability on Diversity[a]

	Equations			
Independent Variables	Diversity Variables, in Linear Form	Diversity Variables, in Quadratic Form	Product Diversity Only, in Quadratic Form	Rumelt Categories
Industry groups[b]				
Chemicals	1.44	1.54	1.41	1.52
	(1.34)	(1.34)	(1.33)	(1.31)
Metal manufacture	−1.06	−1.17	−1.20	−1.19
	(1.34)	(1.33)	(1.33)	(1.34)
Mechanical engineering	−0.07	0.05	−0.09	−0.06
	(1.09)	(1.10)	(1.08)	(1.04)
Instrument engineering	0.04	0.78	0.54	−0.28
	(2.43)	(2.45)	(2.42)	(2.48)
Electrical engineering	4.95***	5.47***	5.32***	4.69***
	(1.34)	(1.36)	(1.34)	(1.35)
Vehicles	−0.47	−0.39	−0.49	−0.49
	(1.68)	(1.68)	(1.67)	(1.62)
Metal goods	0.73	0.72	0.59	0.86
	(1.56)	(1.56)	(1.55)	(1.55)
Textiles	−2.48†	−2.34†	−2.42†	−3.13*
	(1.32)	(1.32)	(1.31)	(1.30)
Clothing and footwear	2.65	2.93	2.79	1.97
	(1.62)	(1.62)	(1.60)	(1.65)
Bricks, pottery, etc.	−0.60	−0.64	−0.75	−0.69
	(1.25)	(1.25)	(1.24)	(1.22)
Timber, furniture, etc.	15.82***	16.30***	16.37***	15.07***
	(3.22)	(3.21)	(3.21)	(3.34)
Paper, printing	0.35	0.56	0.47	−0.31
	(1.51)	(1.51)	(1.50)	(1.58)
Other manufacturing	2.92	3.07	2.85	0.93
	(2.68)	(2.69)	(2.66)	(2.46)
Log of sales (1972−84)	0.10	0.14	0.09	−0.05
	(0.29)	(0.30)	(0.29)	(0.27)
Leverage (1972−84)	−3.91***	−4.03***	−3.96***	−4.30***
	(0.85)	(0.85)	(0.84)	(0.85)
Product diversity (1972−84)	0.24	1.88*	1.84*	
	(0.24)	(0.77)	(0.77)	
Product diversity squared		−0.25*	−0.25*	
		(0.11)	(0.11)	
Multinational diversity (1972−84)	5.28**	2.40	5.21**	6.04***
	(1.75)	(4.66)	(1.73)	(1.62)
Multinational diversity squared		4.50		
		(6.93)		
Rumelt categories[b]				
Dominant-constrained				−0.66
				(0.95)
Dominant-linked and dominant-unrelated				−0.98
				(1.91)
Dominant vertical				−0.59
				(1.36)

TABLE 4 (continued)

	Equations			
Independent Variables	**Diversity Variables, in Linear Form**	**Diversity Variables, in Quadratic Form**	**Product Diversity Only, in Quadratic Form**	**Rumelt Categories**
Related-constrained				2.52
				(1.77)
Related-linked				−0.17
				(0.73)
Unrelated				1.23
				(0.88)
Constant	15.44	13.52	13.59	17.12
R^2	0.300	0.316	0.314	0.314
Adjusted R^2	0.250	0.260	0.262	0.254
ΔR^2 due to:				
Industry groups[c]	0.168***	0.172***	0.173***	0.169***
Log of sales and leverage[c]	0.070*	0.078**	0.068*	0.069*
Diversity variables[c]	0.062***	0.066***	0.074***	0.072**
F	5.960***	5.678***	5.985***	5.540***
N	255	255	255	255

[a] The table shows unstandardized regression coefficients with standard errors in parentheses. The Appendix gives definitions and measurements of the variables; Tables 2 and 3 give their time periods and descriptive statistics.

[b] The regression coefficients for the industry and Rumelt categories show each category's impact on profitability relative to that of the excluded category (food, drink, and tobacco in the case of the industry groups, the single-business group in the case of the Rumelt categories).

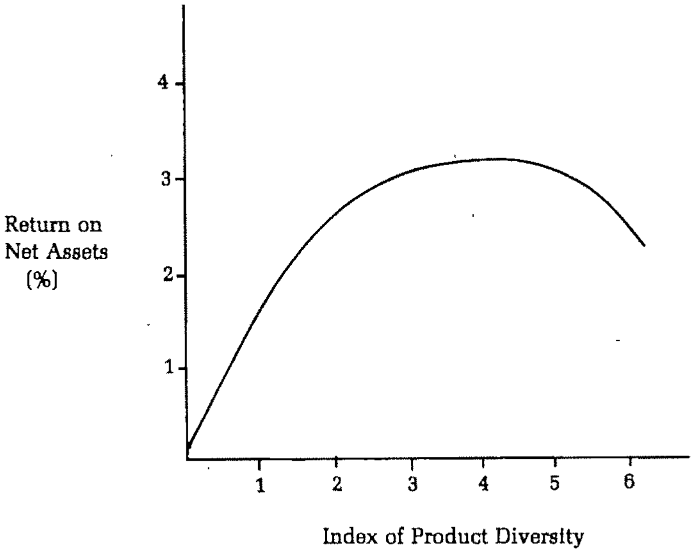
[c] A three-stage hierarchical regression routine was used to measure the increase in R^2 arising from the addition of the three sets of independent variables. F-tests measured the significance of the change in the R^2.

† $p < .10$
* $p < .05$
** $p < .01$
*** $p < .001$

diversity, the quadratic term ($MDIV^2$) was not statistically significant. The third equation, which included product diversity in quadratic form and multinational diversity in linear form, was the optimal formulation in terms of explanatory power. Figure 2 graphs the relationship between product diversity and profitability as estimated by that equation. The graph shows that profitability increased with the index of product diversity up to a level of 3.7; only the most diversified 10 percent of the corporations studied exceeded that level of product diversity.

In the fourth equation, we substituted Rumelt's strategic categories for the index of product diversity. The insignificance of the regression coefficients for the Rumelt categories and the similar changes in R^2 for the diversity variables in equations three and four show that using Rumelt's strategic

FIGURE 2
Relationship Between Product Diversity and Return on Net Assets[a]



[a] The graph shows the increments in return on net assets associated with increasing levels of product diversity as estimated by the equation whose results appear in Table 4, column 3.

categories provided no additional explanation of interfirm differences in profitability over that provided by the simple index of product diversity.

Diversity, both product and multinational, accounted for a small proportion (6.2–7.4%) of the overall variance of profitability across the firms—much less than the influence of industry membership (16.8–17.3%) and marginally less than the firm-structure variables, sales and leverage (6.8–7.8%).

Dynamic Relationships

Tables 5 and 6 show the results of the regression equations involving the change variables. Table 5 shows results that are only modestly consistent with those shown in Table 4. The first equation showed no significant association between diversification and changes in profitability over the period. When a four-year lag was introduced in the second equation, multinational diversification became significantly associated with increases in profitability, but product diversification remained insignificant. Similar results were found for sales growth (Δ *SALES*): multinational diversification had a positive coefficient, the size and significance of which increased substantially with the introduction of a four-year lag, and product diversification was insignificantly associated with sales growth.

Changes in profitability over the period were positively associated with initial levels of diversity. Together, diversity and lagged diversification explained 7.5 percent of interfirm differences in changes in profitability and 23.7 percent of interfirm differences in sales growth.

Our finding that diversification had a more significant impact on firm growth than on profitability lent weight to the view that the positive relationship between diversity and profitability is due to profitability driving diversification (and hence growth) rather than to the opposite configuration. However, when we tested Hypothesis 5 directly by regressing diversification on current cash flow, the results were far from conclusive. Table 6 shows that cash flow was positively associated with both product and multinational diversification, but only the relationship with multinational diversification was statistically significant, and in both equations, the change in R^2 resulting from the addition of cash flow was small and insignificant. The dominating variable in both equations was the initial level of diversity—diversification was greatest among firms that were undiversified at the beginning of the period, and the most diversified firms reduced their diversity over time. That pattern was consistent with the quadratic relationship between diversity and profitability we estimated (Table 4): firms continued to diversify until they encountered negative returns from diversification. Leverage had a significantly positive association with product diversification, indicating that high levels of debt imposed no effective constraint on firms' expansion through diversification. Firm size was positively related to multinational diversification but negatively related to product diversification.

Comparisons between the index of product diversity based on sales data (*PDIV*) and an identical index of product diversity based on firms' profits by activity provided further insight into the direction of the relationship between product diversification and profitability. Dividing the period into three subperiods, we found the average levels of product diversity measured by sales revenue for the firms in the sample to be 2.373, 2.432, and 2.431 for 1972–75, 1976–79, and 1980–84, respectively. The average levels of product diversity measured by profits for the same periods were 2.204, 2.265, and 2.056.

These data may be interpreted thus: since, on the average, firms were typically more diverse in terms of sales than in terms of profits, it follows that profits were more heavily weighted toward firms' primary activities than were sales. The implication is that firms earned higher profit margins on their core activities than on their diversified activities. Moreover, as firms' diversity in terms of sales revenue *increased* over the period, diversity in terms of profits *declined*. This pattern points to diversified activities earning declining profit margins over the period. These data are consistent with the view that the association between product diversification and profitability arises from high-performing firms using their profit earnings to finance diversification.

TABLE 5
Results of Regression of Changes in Profitability and Sales Growth on Diversification[a]

	Return on Net Assets		Growth of Sales Revenue	
Independent Variables	**No Lag**	**Four-year Lag**	**No Lag**	**Four-year Lag**
Industry groups[b]				
Chemicals	−5.20	−5.04	0.37	0.17
	(3.56)	(3.81)	(0.94)	(0.65)
Metal manufacture	−12.70***	−14.10***	−0.86	−0.93
	(3.49)	(3.99)	(0.92)	(0.69)
Mechanical engineering	−7.97**	−9.32**	0.45	0.39
	(2.75)	(3.02)	(0.72)	(0.67)
Instrument engineering	−8.68	−10.21	−0.24	−0.84
	(6.08)	(6.50)	(1.60)	(1.12)
Electrical engineering	−2.88	−2.66	1.72†	1.69*
	(3.63)	(4.44)	(0.95)	(0.86)
Vehicles	−3.18	−3.95	−0.10	−0.29
	(4.34)	(4.64)	(1.14)	(0.99)
Metal goods	−7.85	−6.14	0.16	−0.11
	(4.15)	(4.63)	(1.09)	(0.80)
Textiles	−6.53†	−7.72*	−0.35	−0.56
	(3.42)	(3.89)	(0.90)	(0.67)
Clothing and footwear	−9.64*	−10.08*	−0.43	−0.64
	(4.34)	(4.65)	(1.14)	(0.85)
Bricks, pottery, etc.	−2.57	−4.39	0.59	0.42
	(3.26)	(3.53)	(0.86)	(0.71)
Timber, furniture, etc.	−36.14***	−36.71***	1.79	1.63
	(7.23)	(7.71)	(1.90)	(1.32)
Paper, printing	−7.09†	−8.06†	0.52	0.39
	(3.78)	(4.25)	(0.47)	(0.58)
Other manufacturing	−11.79	−13.33	0.52	0.35
	(9.98)	(10.75)	(0.99)	(1.08)
Log of sales (1972–74)	−0.03	−0.02	−0.67	−0.70
	(0.27)	(0.21)	(0.51)	(0.50)
Leverage (1972–74)	−0.24	0.31	0.09	0.13
	(0.87)	(0.67)	(0.40)	(0.30)
Product diversity (1982–84 minus 1972–74)	0.43		0.24	
	(0.36)		(0.22)	
Product diversity (1978–80 minus 1968–70)		−0.28		0.16
		(0.90)		(0.16)
Multinational diversity (1982–84 minus 1972–74)	2.11		6.50***	
	(3.78)		(1.52)	
Multinational diversity (1978–80 minus 1968–70)		8.06*		9.12***
		(4.00)		(1.88)
Product diversity (1972–74)	0.87†	1.46*	−0.49	−0.23
	(0.48)	(0.56)	(0.89)	(0.65)
Multinational diversity (1972–74)	2.26*	2.38*	1.88†	0.96
	(1.00)	(1.02)	(1.04)	(1.23)

TABLE 5 (continued)

	Return on Net Assets		Growth of Sales Revenue	
Independent Variables	**No Lag**	**Four-year Lag**	**No Lag**	**Four-year Lag**
Constant	−1.16	0.81	2.13	2.43
R^2	0.241	0.263	0.199	0.375
Adjusted R^2	0.140	0.150	0.109	0.275
Δ R^2 due to:				
Industry groups[c]	0.180***	0.178***	0.043	0.039
Log of sales and leverage[c]	0.009	0.010	0.014	0.018
Diversity variables[c]	0.053**	0.075	0.142***	0.237***
F	2.830***	2.760***	2.427***	4.819***
N	163	163	163	163

[a] The table shows unstandardized regression coefficients with standard errors in parentheses. The Appendix gives definitions and measurements of the variables; Tables 2 and 3 give their time periods and descriptive statistics.

[b] The regression coefficients for the industry groups show each group's impact on profitability relative to that of the excluded industry (food, drink, and tobacco).

[c] A three-stage hierarchical regression routine was used to measure the increase in R^2 arising from the addition of the three sets of independent variables. F-tests measured the significance of the change in the R^2.

† $p < .10$, two-tailed test.
* $p < .05$, two-tailed test.
** $p < .01$, two-tailed test.
*** $p < .001$, two-tailed test.

TABLE 6
Diversification Regressed on Cash Flow[a]

Dependent Variables	Product Diversity, 1982–84 minus 1972–74[b]	Multinational Diversity, 1982–84 minus 1972–74[b]
Industry groups[b]		
Chemicals	0.09	0.06†
	(0.29)	(0.04)
Metal manufacture	0.66*	−0.01
	(0.30)	(0.04)
Mechanical engineering	0.34	0.05†
	(0.25)	(0.03)
Instrument engineering	0.22	0.05
	(0.53)	(0.07)
Electrical engineering	0.06	0.07†
	(0.31)	(0.04)
Vehicles	0.05	−0.01
	(0.34)	(0.05)
Metal goods	0.42	0.06
	(0.34)	(0.05)
Textiles	0.20	0.00
	(0.29)	(0.04)

TABLE 6 (continued)

Dependent Variables	Product Diversity, 1982–84 minus 1972–74[b]	Multinational Diversity, 1982–84 minus 1972–74[b]
Clothing and footwear	0.72*	−0.02
	(0.36)	(0.05)
Bricks, pottery, etc.	0.11	0.06
	(0.28)	(0.04)
Timber, furniture, etc.	−0.13	−0.08
	(0.65)	(0.09)
Paper, printing	−0.13	−0.03
	(0.32)	(0.04)
Other manufacturing	−0.37	0.03
	(0.85)	(0.04)
Log of sales (1972–74)	−0.09†	0.03***
	(0.05)	(0.01)
Leverage (1972–74)	0.35*	0.02
	(0.18)	(0.02)
Product diversity (1972–74)	−0.28***	
	(0.05)	
Multinational diversity (1972–74)		−0.18***
		(0.05)
Cash flow	0.00	0.00**
	(0.01)	(0.00)
Constant	−0.08	−0.11
R^2	0.269	0.154
Adjusted R^2	0.196	0.090
ΔR^2 due to:		
Industry effects[c]	0.056	0.082
Log of sales and leverage[c]	0.032	0.024
Initial diversity[c]	0.180***	0.035*
Cash flow[c]	0.001	0.013
F	3.703***	2.412***
N	189	243

[a] The table shows unstandardized regression coefficients with standard errors in parentheses. The Appendix gives definitions and measurements of the variables; Tables 2 and 3 give their time periods and descriptive statistics.

[b] The regression coefficients for the industry groups show each group's impact on profitability relative to that of the excluded industry (food, drink, and tobacco).

[c] A three-stage hierarchical regression routine was used to measure the increase in R^2 arising from the addition of the three sets of independent variables. F-tests measured the significance of the change in R^2.

† $p < .10$, two-tailed test.
* $p < .05$, two-tailed test.
** $p < .01$, two-tailed test.
*** $p < .001$, two-tailed test.

DISCUSSION

On the Profitability of Diversified Corporations

The findings lend support to our first two hypotheses. For the most part, diversity was positively associated with profitability, consistent with Hypothesis 1. However, in the case of product diversity, we observed diminishing returns to diversification and, after a point, further increases in diversity were associated with declining profitability, consistent with Hypothesis 2. The tendency for the firms that were the most diversified in 1972–74 to reduce their diversity during subsequent years further supports the implication of those results: firms face constraints on the amount of product diversity they can successfully manage.

This finding of a quadratic relationship between diversity and profitability sheds new light on the findings of prior studies. Direct comparisons are not easy because most research has measured diversity by the Wrigley-Rumelt strategic categories. However, Montgomery (1982) showed that a continuous diversity index, similar to the index of product diversity used in this study, corresponded closely to the Wrigley-Rumelt categories. Hence, the previous research finding that related-business firms are generally more profitable than unrelated firms may not be due to related diversification's superiority to unrelated diversification, but rather to the fact that the unrelated category typically contains the most diverse companies. To this extent, our findings are consistent with those of Rumelt (1974, 1982), but our interpretation differs.

Causality in the Relationship: Hypothesis 1 Versus Hypothesis 5

Further investigation of the mainly positive relationship between diversity and profitability by analyzing changes over time offered only limited insight into causality. In the case of product diversification, the relationship was weak in both directions: diversification was unrelated to subsequent changes in profitability, and current profitability (cash flow) was insignificantly related to diversification. Our failure to find relationships between product diversification and changes in profitability may reflect the influence of intervening variables. Whether diversification was by acquisition or new venture (Lamont & Anderson, 1985) may be be important. Or relationships may not be evident because returns from diversification take longer than four years to materialize. In that case, there is little prospect that statistical analysis can identify the impact of diversification.[13] However, additional information shed further light on the relationship. The observation that firms earned a higher margin on their core activities than on their diversified activities was consistent with the view that profits drive diversification rather than vice versa.

In the case of multinational diversification, a strong two-way causation was evident: profitability in the domestic market encouraged overseas expansion, and expansion in turn generated increased profit. We also observed diversified firms improving their performance over time, which was consistent with the prediction that technological, organizational, and managerial innovations have made corporate organization more efficient than market organization (Hypothesis 4).

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[13] It was also suggested to us that the absence of a positive relationship between diversification and changes in profitability might be a result of the bid premiums paid by firms that diversify by acquisition; such premiums might depress a firm's profitability. This was unlikely in our analysis because, when measuring profitability, we excluded goodwill from the net assets of firms.

The Role of Relatedness in Diversity-Performance Relationships

Our study found the Rumelt classification of diversification strategies to be of little value in understanding the relationship between diversity and profitability. The differences in profitability between categories that we did observe appeared to be due more to differences in the overall index of diversity than to the nature of the relationship between firms' businesses. Our findings offer further support to the case Montgomery (1982) made for continuous, quantitative, SIC-based measures of diversity in preference to strategic categories.

On the other hand, we did observe clear differences between product and multinational diversity in their relationships with profitability. As already noted, we observed no evidence of an association between high levels of multinational diversity and a downturn in profitability, which suggested either that the benefits of multinationality were sufficiently large to offset any additional costs of managing complexity or that multinational diversity did not impose such severe managerial and organizational problems as product diversity. Moreover, the strong two-way relationship between multinational diversification and profitability that we observed contrasted with the weak relationships for product diversification.

Our findings support the hypothesis that multinational diversification offers greater potential for exploitation of economies of scope and for economizing on transaction costs than does product diversification. However, generalization is hazardous: the low rate of return earned in British manufacturing industries during most of the period may be the principal explanation for the profitability of multinational diversification.

The underlying issue—the role of relatedness in the diversification-performance relationship—remains uncertain. Despite our failure to identify significant performance differences between Rumelt's strategic categories, it does not follow that relatedness has no effect on the success of diversification. The key problem is the identification and measurement of relatedness. The relatedness underlying our categorization of firms is market or technological linkage. However, the potential for firms to create competitive advantages through the exploitation of economies of scope in intangible assets may be associated with other dimensions of relatedness. For example, successful diversification may be based on intangible, firm-specific assets such as financial management skills, superior access to capital markets, expertise in identifying takeover candidates and managing turnarounds, and organizational structures and control systems that permit the efficient and flexible management of diversified corporate empires. Within our unrelated business category were Hanson Trust and BTR. Both were prominent conglomerates whose businesses, although diverse, shared certain strategic similarities, and above all were amenable to the particular organizational and financial management skills for which the corporate managements of these companies are well known.

The Importance of Diversification as a Determinant of Firm Profitability

Finally, our results concerning the impact of diversity and diversification on performance need to be balanced by the observation that those variables, however measured, accounted for a small proportion of interfirm differences in profitability. Industry membership accounted for a larger proportion. Those findings confirm Schmalensee's (1985) findings that industry effects were far more important than firm effects in determining interfirm differences in accounting rates of return. However, that does not imply that diversification strategy has little impact on firm performance. Our analysis only estimated simple, cross-sectional, functional relationships between profitability and fairly crude indexes of diversity. The total impact of diversification on performance depends on complex interactions between diversification strategy, corporate capabilities and resources, and external environment.

CONCLUSIONS

The research we have presented adds to present knowledge on the performance consequences of diversification both by extending research to British data and by revealing new dimensions of the relationship between diversity and profitability. Our key findings were that diversity and profitability had a positive relationship but that product diversity led to declining profitability once firms encountered limits to complexity. We also found that relatedness, as measured by the Rumelt categorization, was unrelated to differences in profitability. At the same time, multinational diversity was more strongly associated with profitability than was product diversity.

Causality was complex and difficult to diagnose. In the case of multinational diversification, a strong two-way relationship with profitability was apparent. In the case of product diversification, causation was weak in both directions. On balance, the evidence pointed more toward profitability inducing product diversification than toward diversification generating profit. At the same time, we found that diversified firms increased their relative profitability over time, supporting our prediction that technology and learning have increased the effectiveness and efficiency with which diversified corporations are managed.

Two important issues for future research arise from our study. The first concerns the role of relatedness in the relationship between diversification and performance. The poor explanatory power of Rumelt's categorization points to the need to test the usefulness of other diversification measures encompassing relationships between businesses. Promising approaches include the entropy measure of diversity (Jacquemin & Berry, 1979), measures of diversification that take account of cyclicality, such as Amit and Livnat's (1988) measure of efficient conglomerate diversification, and analyses of matched pairs of businesses along multiple strategic dimensions (Davis, 1987). Even more important is the need for closer investigation of the different dimensions of relatedness between businesses. The Rumelt categorization, like the SIC codes, is based primarily on operational relatedness. Recent research points to the importance of strategic relatedness, through, for example, "financial synergy" (Chatterjee, 1986) and "dominant logic" (Prahalad & Bettis, 1986).

A second issue concerns the relative merits of coarse-grained and fine-grained research methodologies in the study of diversification (Harrigan, 1983). Although large-sample statistical research of the type in this study is a powerful means of identifying general relationships between pairs of variables, it is a comparatively weak method for gaining insight into complex interactions between variables that are not amenable to precise functional modeling. We found that diversification explained only small proportions of interfirm variability in profitability and had difficulty diagnosing causation. Those results reflect the fact that the total impact of diversification on performance depends on interactions between diversification and industry membership, firm resources, and organizational and managerial capabilities. Large-sample studies like ours cannot easily model such complex and idiosyncratic interactions involving a large number of firm-specific factors. To gain insight into the complex interactions between strategy, organization, and environment, detailed examination of the experiences of individual firms is needed. Further investigation may benefit from examining the role of specific organizational structures and management systems developed by the more successful diversified corporations (Dundas & Richardson, 1982) and the interaction between diversification strategies and organizational metamorphosis (Tushman & Romanelli, 1985). The research we have in progress now builds upon the findings of our large-scale statistical analysis by using a small-sample, finer-grained investigation to gain deeper understanding of the relationships between diversity, diversification, and performance that we have observed.

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APPENDIX

Diversity Variables

Rumelt's classification (Rumelt, 1974: 204–209) identifies eight categories of diversification strategy based on (1) the specialization ratio, the proportion of sales attributable to a firm's largest business activity; (2) the relatedness ratio, the proportion of a firm's sales in business activities that are related to one another; and (3) the nature of the relationship between business activities. Three relationships are distinguished: vertical diversification, in which one business is the customer of another; constrained diversification, in which each business is related to every other business; and linked diversification, in which each business is related to at least one other business.

Jammine (1984) classified firms into the Rumelt categories. Classification required a major element of subjective judgment relating to (1) what the boundaries of individual business activities were and (2) whether or not two activities were related. The procedure was to follow Rumelt's (1974) method as closely as possible and to define relatedness in terms of market and technological similarities. Each of the authors of the present study reviewed the categorizations, which were also cross-checked against those of other research (Channon, 1973, 1982). This check revealed a reassuring degree of consistency.

The **index of product diversity** (***PDIV***) was defined as:

$$PDIV = \frac{1}{\sum_{i} \frac{S_i^2}{\sqrt{N_i}}}$$

where S_i is the proportion of the firm's sales reported in activity i, and N_i is the number of Stock Exchange Classification industries comprising activity i.

Values of *PDIV* correspond to the number of industries in which a firm would be engaged if its sales were equally distributed across each industry. For example, a firm would have a *PDIV* of 4 if its sales were equally distributed over four business activities. Because British firms do not report sales and profits according to any standard industrial classification, we adjusted *PDIV* for differences in the degree of disaggregation of each firm's reporting by dividing each S_i^2 by N_i.

The **index of multinational diversity (*MDIV*)** was measured by firms' reporting the breakdown of sales between U.K. and overseas subsidiaries in their annual reports:

$$MDIV = 1 - \frac{\text{U.K. production}}{\text{total sales}} .$$

Performance Variables

The **rate of return on net assets (*ROA*)** was defined as

$$ROA = \frac{\text{operating profit (before interest and tax)}}{\text{fixed assets + net current assets + short-term loans}} .$$

ROA and the other financial variables are based on company accounts data in which asset values are at historic cost.

Cash flow (*CASHF*) was similar to ROA, but profits were adjusted to eliminate items that did not involve any cash flow:

$$CASHF = \frac{\text{operating profit (after interest and tax) + depreciation}}{\text{fixed assets + net current assets + short-term loans}} .$$

Sales growth (Δ *SALES*) was measured as

$$\Delta\ SALES = \frac{\text{average annual sales revenue 1982–84}}{\text{average annual sales revenue 1972–74}} .$$

Other Variables

Firm size (*SALES*) was measured by sales revenue. The source was the EXSTAT computerized company accounts data base. Because of the skewed distribution of firm size in our data set, we used the logarithm of firm size with its more normal distribution in the regression analysis.

Leverage (*LEV*) was measured as

$$LEV = \frac{\text{total debt (including short-term borrowing)}}{\text{shareholders' funds}} .$$

Industry effects. Using company annual reports, Jammine (1984) assigned the firms to SIC orders 3 to 19 on the basis of their largest activity by sales. The SIC orders were 3, food, drink, and tobacco; 5, chemicals and allied industries; 6, metal manufacture; 7, mechanical engineering; 8, instrument engineering; 9, electrical engineering; 10, shipbuilding and marine engineering; 11, vehicles; 12, metal goods not elsewhere specified; 13, textiles; 14, leather and leather goods; 15, clothing and footwear; 16, bricks, pottery, glass, and cement; 17, timber, furniture, etc.; 18, paper, printing, and publishing; 19, other manufacturing. Order 4, petroleum refining, was eliminated because we excluded oil companies, and none of the firms studied was assigned to order 10, shipbuilding. Each industry, with the exception of the excluded industry (food, drink, and tobacco), was included in the regressions as a binary dummy variable.

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ENVIRONMENT, GENERIC STRATEGIES, AND PERFORMANCE IN A RAPIDLY DEVELOPING COUNTRY: A TAXONOMIC APPROACH

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Multivariate analyses of 54 firms in the high-growth electronics industry in Korea showed that top management perceived multiple environments within the industry. The characteristics of the four strategic groups identified in this study were generally consistent with those of the generic strategies identified by Porter and by Miller, and the four environmental settings that emerged were classified primarily on the basis of two dimensions, technical dynamism and bargaining power. High-performing cost leaders and high-performing differentiators were found in different environments. Also, firms without a clearcut generic strategy performed less well than those using generic strategies.

Conceptual and empirical taxonomic approaches, a recent development in contingency theory, appear to provide a useful methodology for developing midrange theories in strategic management. Several studies have used taxonomic approaches to empirically identify strategic groups or strategic gestalts within an industry or across industries (Dess & Davis, 1984; Hambrick, 1983b; Harrigan, 1985; Hatten & Schendel, 1977; Hatten, Schendel, & Cooper, 1978; Hunt, 1972; Newman, 1973, 1978; Schendel & Patton, 1978). Many of those studies, however, undertaken in relatively mature or declining industries and oriented predominantly toward the industrial organization economics discipline, have used narrow criteria and only one or a few variables to classify firms into strategic groups. Furthermore, the studies have primarily focused on a developed economy, the United States. McGee and Thomas (1986) provided a useful review of the studies.

There appear to be two avenues through which theories related to taxonomic approaches in strategic management might be further developed. The first is a broadening of concepts related to strategic management so that they will better reflect the complexity of the strategy construct along with a broadening of theoretical frameworks by incorporating new variables. The

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second avenue is to investigate the external validity of the strategic taxonomy theories and associated research findings by conducting studies similar to those cited above in more dynamic industries and different economic conditions. This research mainly pursued the latter, studying the dynamic electronics industry in a rapidly developing country, Korea, where effective strategic management at the firm level has become essential. It also attempted to a limited extent to extend the existing theories by identifying multienvironments within an industry and examining relations among environment, strategy, and performance.

Since this study was the first of its kind in a developing economy, it was basically exploratory. It attempted to answer the following research questions: (1) Do top managers of different firms in the same industry perceive their environments to be the same? (2) Are the generic strategies used in a developing country consistent with those identified in developed countries? (3) How do different strategies correspond with different perceived environments, and what are the results of various configurations for firms' financial performance?

THEORETICAL BACKGROUND

Environmental Heterogeneity in a Single Industry

Some theorists and research have treated environments as objective facts independent of firms, and others have treated environments as perceptually determined and enacted. This unresolved issue has been a source of contradiction in empirical results. Bourgeois (1980), however, concluded that the issue was not whether measures should be objective or perceptual; rather, he suggested that both the objective and the perceived environments are real and relevant to an organization's strategy. Objective environment is relevant to primary strategy making (domain selection), and perceived environment is a prime input to secondary strategy making (domain navigation). In this study, environment was a perceptual construct as we dealt with strategy that involves navigating within a chosen domain.

Most existing studies have developed taxonomies across different industries. Ginsberg and Venkatraman (1985) revealed that 22 of the 25 studies reviewed adopted a multiindustry sample for testing the impact of contingency variables on strategy, nearly two-thirds of them using the Profit Impact of Market Strategies (PIMS) data base. For example, Hambrick (1983a) developed a taxonomy of environment that cut across the boundaries of multiple industries and then developed a taxonomy of firm position within each environment. Such an approach to identifying environmental homogeneity across industries is an effective one for understanding the complexity of interindustry strategic groupings, given the increasing trend toward business diversification. Generalization across industries can enhance any strategy theory, but the development of taxonomies across industries has its own problems. Moving from one industry to another may cause problems in terms of comparability among measures of strategy and its correlates (Snow

& Hambrick, 1980). Thus, Ginsberg and Venkatraman (1985) and Datta (1980) advocated studying individual industries, developing "industry recipes."

Those who have studied a single industry have tended to assume environmental homogeneity. For example, Dess and Davis (1984), in their empirical study of a single industry (paint and allied products), assumed that its environment was homogeneous at the Standard Industrial Classification (SIC) four-digit level. But there may be more than one environment in a single SIC four-digit industry. Porter (1985) suggested that segments of industries had structures, just as industries did, implying the existence of multienvironments within a single industry. Hatten and Schendel (1977) found that different firms competed differently within an industry because they viewed their environments on an idiosyncratic basis and made resource allocation decisions on that basis. In short, it is environmental differences that account for differences in strategy, as strategy is a pattern or stream of decisions taken to achieve the most favorable match between external environment and organization (Chakravarthy, 1982; Hofer, 1975; Lawrence & Dyer, 1980; Mintzberg, 1978).

Previous studies in Korea also provide evidence that firms in a single industry face different environmental constraints and contingencies. Kim and Utterback (1983) found that the electronics industry had both growing and mature sectors. In the machinery industry, Kim and Kim (1985) found that firms experienced different environmental constraints in undertaking innovation projects. Kim, Kim, and Lee (1985) identified four different environmental settings in the pharmaceutical industry.

On the whole, the literature suggests that it is differences in environmental characteristics that might explain the formation of multiple strategic groups within an industry. Thus, it is desirable to look for multiple environments within a single industry and relate them to the strategies pursued in order to gain a fine-grained understanding of intraindustry configurations of perceived environments and strategies.

Generic Strategies in a Developing Economy

A number of both conceptual and empirical research studies have advanced the concept of strategic types at the business level. Such types are often referred to as *generic strategies, gestalts*, or *strategic archetypes* (Fahey & Christensen, 1986).

Strategic types and their characteristics vary depending largely on differences in the key decision variables identified or analyzed by each author. As Miles and Snow (1978) noted, the behavior of organizations is so diverse that it does not permit the development of any comprehensive typology capable of encompassing every aspect of organization. Therefore, this study, like previous ones, had to simplify, focusing on a limited domain of key strategy variables that appear particularly amenable to explanation.

This study adopted a set of key decision variables suggested by Porter (1980) for three reasons. First, Porter's generic strategies—overall cost leadership, differentiation, and focus—were constructed in relation to profitability performance, which is the focus of this study. Second, Porter's types bear some relationship to other strategy categorizations in the literature, as Miller and Friesen suggested: "For example, Miles and Snow's (1978) prospectors and Miller and Friesen's (1978, 1984) SB adaptive firms differentiate via product innovation. Hambrick (1983a), Dess and Davis (1984), and Henderson (1979) have all discussed cost leadership, a strategy often used by Miles and Snow's (1978) defenders. Miller and Friesen's (1984) niche innovators pursue a focus strategy" (1986a: 38). Third, Porter's generic strategies have received more empirical support from previous research than other constructs have.[1]

Can theories related to generic strategies developed in an industrialized country be transferred to a developing country? There appear to be two contrasting views in the relevant literature on the transferability of theories concerning organization-environment relationships. The first view is that such theories are not applicable to developing countries. After reviewing 94 studies on organizations in developing countries, Kiggundu, Jorgensen, and Hafsi (1983) concluded that theories grounded in data from industrialized countries appeared to be useful for understanding problems in the technical core of organizations in developing countries but were not so useful for understanding organization-environment relations.

The second view supports the argument that some theories related to organization-environment are transferable to developing countries. In a study of electronics firms in Korea, Kim (1980b) found that firms with an organic structure were more innovative than those with a mechanistic structure, supporting the results of previous studies in industrialized countries (i.e., Burns & Stalker, 1961; Hage & Aiken, 1967). Kim and Utterback (1983) also concluded that organizations in both industrialized and developing countries adopted strategies viable for their given environments and that striking differences in relationships among various organizational variables between industrialized countries and developing countries may stem from differences in the direction of environmental change.

Given the inconclusive empirical results on the transferability of organizational theories to developing countries, this study sought to determine if the generic strategies that have been observed in developed countries are evident among firms in a developing economy.

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[1] Other generic strategy typologies were not as useful as Porter's for this study. For example, Buzzell, Gale, and Sultan's (1975) strategies are related too narrowly to market-share performance. Miles and Snow's (1978) typology integrates the range of relationships between strategy, structure, and processes but does not connect them to performance. Hofer and Schendel (1978) were primarily concerned with offering generic strategies compatible with the product life cycle concept, but that concept is not relevant in developing economies, which usually introduce new products that have matured or declined in developed countries. Utterback and Abernathy (1975) framed strategies as responses to the evolution of technological environments, but the pattern of technological evolution in developing countries is dissimilar to that in developed countries (Kim, 1980a; Kim & Utterback, 1983).

Relations Among Environment, Strategy, and Performance

Successful business strategies depend on defining an appropriate relationship between variables within managerial control, such as marketing, production, and investment decisions, and variables that are generally beyond the direct control of management. Business performance is, for instance, a function of controllable or strategic variables and noncontrollable or environmental variables (Hatten, Schendel, & Cooper, 1978). The logic relating environment to strategy and in turn to performance is compelling, but empirical demonstrations of the relationships have only recently been made for developed countries and have yet to be made for developing countries.

Studying PIMS data, Woo and Cooper (1981) found that effective low-market-share businesses and effective high-market-share businesses chose to operate in different environments. Further, they found that within the same environment, the competitive strategies of the former differed significantly from those of the latter and also from those of ineffective low-market-share businesses. Among effective businesses with low market shares, those in dissimilar environments pursued different competitive strategies as well. Miller and Friesen (1977) summarized their findings by saying that each successful archetype adopted a different strategy to cope with a different environment. MacMillan, Hambrick, and Day (1982) found that different strategic attributes were associated with performance in different cells of the Boston Consulting Group, although some common strategic attributes had a strong association with profitability in each cell. In his empirical field study of savings and loan associations, Lenz (1980) found that the combination of environment, strategy, and organizational structure in high-performance firms differed significantly from that associated with low-performance firms. On the basis of empirical studies, Hambrick (1983a) also suggested that various strategies did not lead to equal success within an industry and that some strategies were more successful than others, depending on the type of environment.

Miller concluded that "particular strategies and structures commonly go together, and are often found in certain types of environment" (1987: 70). But his attempt to relate those relationships to performance did not reveal any consistently significant differences. Miller and Friesen (1986a,b), studying Porter's generic strategies and performance, concluded that having strategic advantages rather than strictly adhering to Porter's generic strategies caused successful performance.

In light of the rudimentary level of the conceptualizations and empirical demonstrations of the match between environmental characteristics and generic strategies and its performance implications, even in developed countries, this study attempted to provide suggestive descriptions of the relationships among environment, strategy, and performance in a developing country.

METHODS

Sample

The data for this study were collected from 54 firms in the electronics industry in Korea, which is growing dynamically in terms of product development and production volume. Korea is one of the most rapidly industrializing countries. Its GNP increased at an average annual rate of over 7.9 percent during the decade 1974–83, and its manufacturing sector grew even faster during the same period, with an average annual increase of 11.8 percent. Electronics is one of Korea's fastest growing industries, with an increase in production volume of more than 22.2 percent per year during 1974–83 and a yearly increase in exports of more than 20.5 percent. The number of firms in the industry increased from 231 to 1,026 during the same period.

The use of random probability sampling (McKelvey, 1975) would have resulted in an overrepresentation of small firms, as they accounted for 93.85 percent of the population. As an alternative, we selected the 54 firms from the 1,026 firms on the basis of a stratified sampling technique (Kish, 1965: 320).

Data Collection

To gain access to the firms, we telephoned them and sent them a letter from the president of our university, explaining the nature and significance of the proposed research. All firms contacted were cooperative.

A pilot study of five firms was undertaken in order to test and improve an instrument we developed on the basis of the literature. We collected data for both environmental and strategy variables through interviews in Korean with top managers, mostly senior vice presidents. We conducted open-ended discussions before the structured interviews in an attempt to effectively communicate the meanings of questions and to establish the reliability of measures by cross-checking answers between the two modes. Whenever possible, we conducted cross-interviews with top managers who were not respondents to establish the data's reliability. Performance measures were obtained from published financial statements.

Variables and Measurements

The 13 environmental variables included in this study (see Table 1) reflect both Porter's (1980) scheme for the structural analysis of industries and Dill's (1958) task environment components. They cover such areas as firm bargaining power in relation to buyers and suppliers, the possibility of vertical integration, the behavior of competitors affecting market stability, the threat of substitute products, and the degree of technological change. The Appendix contains the instruments used to measure the environmental variables.[2]

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[2] The original instruments in Korean may be obtained from the authors.

The 15 strategy variables used in this study (see Table 2) to identify strategic groups reflect the multifaceted nature of the strategy construct. They include variables related to product development, manufacturing, and marketing. We chose variables that appeared frequently in the literature and that seemed to us to be theoretically appropriate. See the Appendix for the instruments. Respondents were also asked if any major shifts had occurred in any aspect of their environment or their strategies during the previous three-year period; no managers in any firm reported such shifts. Strategies appear to endure over time (Miller, 1981).

Return on assets (ROA), return on equity (ROE), and sales growth rate, all measured in terms of three-year (1980–82) averages, were used as performance measures in this study. Although there are problems in using these performance indicators (i.e., variations in depreciation methods, inventory valuation, etc.), they are convenient measures to collect, and they reflect the primary objective of most firms in a rapidly growing industry. Furthermore, financial indicators are the most useful measures of organizational performance at the macroorganizational level (Van de Ven & Ferry, 1980).

Analysis

Because there were significant intercorrelations among some strategy and among some environmental variables (see Tables 1 and 2), factor analysis was undertaken for each concept to identify a set of underlying dimensions. Though the sample was relatively small, it met certain general criteria for factor analysis.[3] We applied the latent root criterion, which specifies an eigenvalue greater than 1, to determine the number of factors to be extracted. Factor scores were then used for cluster analysis in order to develop taxonomies for both environmental settings and strategic groups.

Cluster analysis is known to be more useful than other multivariate techniques in developing empirical taxonomies (Hambrick, 1984; Harrigan, 1985). Cluster analysis has a variety of somewhat ad hoc procedures—hierarchical techniques, optimization-partitioning techniques, density techniques, and clump techniques—each of which has certain advantages and disadvantages (Everitt, 1980). All clustering techniques, however, present four general problems: intercorrelation among variables, variation in units of measurement, difficulties in determining the number of clusters to be formed, and the lack of appropriate ways to test their statistical significance (Frank & Green, 1968).

After performing a factor analysis with orthogonal rotation, we eliminated the problem of different units of measurement by standardizing variables (mean = 0, s.d. = 1) in developing factor scores. We determined the number of clusters by looking for a pronounced increase in "tightness" (mean-squared error) of clusters as the clustering moved from one solution to the next (Hambrick, 1984). Finally, we used ANOVA, Duncan multiple range tests, and multiple discriminant analyses to test whether clusters differed significantly (Anderberg, 1973).

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[3] Hair, Anderson, Tatham, and Grablowsky (1979) suggested that, as a conservative rule, the number of cases in a sample should be at least 50 and at least four times the number of variables in the analysis.

In clustering based on both the environmental and strategy dimensions, this study used the minimum variance hierarchical technique (Aldenderfer & Blashfield, 1984). The sorting strategy was based on Euclidean distance.

There appear to be two ways to develop a taxonomy of strategic groups in relation to a taxonomy of environmental settings. The first method is to use a multitier framework (Hambrick, 1984) by developing a taxonomy of environmental settings and then a taxonomy of strategic groups (in this case, strategic positions and then strategic choices) within each environmental setting. The second method is to develop a taxonomy of strategic groups independent of environmental taxonomy and then to relate the two taxonomies with one another. We adopted the second approach as it appeared to have two advantages: (1) it required a single cluster analysis using the full sample and (2) it facilitated the identification of similarities among different strategic groups across the boundaries of environmental settings, particularly when only two taxonomies were related.

RESULTS

Tables 1 and 2 show the means, standard deviations, and intercorrelations for the environmental and strategy variables, and Table 3 shows the results of the factor analysis of the 13 environmental variables. Five factors accounted for 69.7 percent of the total variance. The first factor, degree of competition, is highly correlated in terms of factor loading with the first three variables, all of which indicate the dynamics of market structure. Although it might seem that number of exits should be negatively loaded to be consistent with the results for degree of competition, we suggest that the positive loading of the variable is consistent, because keen competition forces the unfit to leave the market. The second factor, bargaining power, includes three variables with factor loadings above .40 that reflect a firm's bargaining position with its suppliers and buyers. The third factor is negatively correlated with degree of technological change but positively correlated with number of competitive products in a market. When technology changes rapidly, only innovative firms can compete with each other, but when technology remains stable, other firms can also enter the market, increasing the number of competitive products. We labeled this factor technical stability based on the most highly loading variable. The fourth factor, entry threat, has two variables with high factor loadings that reflect potential entry threats from both buyers and suppliers. The last factor, resource tension, is highly correlated with three variables that reflect instability in material and parts prices and uncertainty in acquiring workers.

The five dimensions were used for the subsequent cluster analysis to develop a taxonomy of environmental settings. Table 4 reports their means, standard deviations, and intercorrelations and those of the strategy dimen-

TABLE 1
Means, Standard Deviations, and Intercorrelations of Environmental Variables[a]

Variables	Means	s.d.	1	2	3	4	5	6	7	8	9	10	11	12
1. Threat of backward integration	3.49	1.99												
2. Scope of distribution channel	3.91	1.71	−.06											
3. Price change of materials/parts	2.81	1.54	−.05	−.05										
4. Ease in hiring technical personnel	3.39	1.52	−.09	.09	−.09									
5. Threat of forward integration	3.21	1.85	.40	.02	−.02	−.10								
6. Difficulty in procuring raw materials	4.72	1.16	.17	.07	.36	−.32	.15							
7. Alternative sources of raw materials	4.24	1.65	−.11	.49	.18	−.02	−.06	.18						
8. Degree of vertical integration	4.20	1.66	−.10	.38	.10	.13	.04	.11	.27					
9. Degree of technological change	1.74	1.21	−.08	−.11	−.26	−.03	.01	−.12	−.24	−.29				
10. Number of competitive products	4.23	2.00	.35	−.16	.01	−.10	.20	.03	.08	−.07	−.42			
11. Number of competitors	9.40	9.46	.10	−.04	−.21	−.16	.02	.01	.18	−.06	−.06	.33		
12. Number of entrants	3.87	5.12	.23	.05	−.12	−.14	.30	.11	.27	−.22	.08	.40	.67	
13. Number of exits	2.39	4.26	−.08	.18	−.21	−.13	.03	.04	.14	−.11	.24	.05	.35	.30

[a] Correlations greater than .24 are significant at $p < .05$.

TABLE 2
Means, Standard Deviations, and Intercorrelations of Strategy Variables[a]

Variables	Means	s.d.	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1. New product development	4.74	1.42														
2. Operating efficiency	4.64	1.10	.41													
3. High product quality	5.08	1.15	.50	.63												
4. Product differentiation	4.90	1.48	.70	.42	.45											
5. Marketing differentiation	4.32	1.34	.46	.32	.37	.57										
6. Acquiring high-caliber work force	4.40	1.35	.55	.56	.68	.50	.40									
7. Economy of scale	4.30	1.56	.42	.53	.51	.45	.45	.60								
8. Advertising	3.44	1.41	.50	.33	.36	.47	.41	.34	.34							
9. Procurement of raw materials	4.38	1.03	.38	.59	.36	.35	.38	.40	.45	.32						
10. High-price product	4.48	1.31	.56	.33	.45	.55	.37	.49	.49	.48	.24					
11. Marketing by credit and discount	4.10	1.29	.37	.26	.21	.49	.40	.18	.28	.54	.34	.28				
12. Extension of market channel	4.32	1.30	.50	.49	.55	.44	.62	.34	.43	.50	.56	.36	.59			
13. Image building of firm and product	4.78	1.25	.58	.48	.67	.40	.32	.60	.49	.42	.34	.43	.15	.44		
14. Emphasis on specialized market	4.56	1.31	.30	.22	.44	.26	.39	.29	.26	.49	.42	.35	.31	.50	.53	
15. After service	5.06	1.30	.40	.35	.59	.43	.24	.51	.15	.29	.31	.15	.18	.29	.53	.26

[a] Correlations greater than .24 are significant at $p < .05$.

TABLE 3
Varimax-rotated Matrix of Environmental Variables

	Factors				
Variables	**Degree of Competition**	**Bargaining Power**	**Technical Stability**	**Entry Threat**	**Resource Tension**
Number of competitors	**.786**	−.049	.118	.023	−.017
Number of entrants	**.800**	.017	.113	.289	.072
Number of exits	**.495**	.105	−.304	−.037	.020
Scope of distribution channel	.059	**.899**	−.143	.045	−.074
Alternative sources of raw materials	.287	**.575**	.170	−.157	.196
Degree of vertical integration	−.200	**.491**	.183	−.046	.014
Number of competitive products	.357	−.132	**.519**	.329	.011
Degree of technological change	.028	−.240	**−.839**	−.022	−.077
Threat of backward integration	.060	−.114	.129	**.689**	.055
Threat of forward integration	.070	.028	−.023	**.602**	.084
Price change of materials/parts	−.241	.063	.268	−.116	**.499**
Ease in hiring technical personnel	−.192	.119	.061	−.086	**−.390**
Difficulty in procuring raw materials	.012	.149	.011	.177	**.777**
Eigenvalue	2.583	2.093	1.776	1.379	1.225
Percent of cumulative variance	19.9	36.0	49.6	60.2	69.7

sions and performance measures, all which were used as inputs for the final analysis.

Table 5 reports the characteristics of four environmental settings derived from the cluster analysis of firms on the five environmental factors. Following Calantone and Cooper (1981), we validated these results in two ways. First, ANOVA and Duncan multiple range tests were used to detect differences in the means of factors; results were satisfactory, supporting differences between the total sample mean and the mean in each cell. Second, we ran a multiple discriminant analysis that resulted in correct classification of over 98 percent of the firms.[4]

As Table 5 shows, the dominant characteristic of the first environmental setting is weak bargaining power, and technical stability is an accompanying characteristic. We labeled this setting a weak bargaining power environment. The second setting, significantly associated only with the degree of competition, was labeled a competitive environment. Strong bargaining power is the dominant characteristic of the third setting. The last environmental setting is significantly associated with technical dynamism (the inverse of technical stability) and with relative ease in acquiring supplies. Since the second variable does not appear to be useful in characterizing the environment and is the weaker of the two, we labeled the setting a technically dynamic environment. The results of Duncan multiple range tests also sup-

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[4] The sample might be argued to be too small to assume a normal distribution, but multiple discriminant analysis is not sensitive to minor violations of its statistical assumptions (Klecka, 1980).

TABLE 4
Means, Standard Deviations, and Intercorrelations of Environmental and Strategy Dimensions and Performance Measures[a]

Variables	Means	s.d.	1	2	3	4	5	6	7	8	9	10	11
1. Degree of competition	0.00	0.87											
2. Bargaining power	0.00	0.91	.01										
3. Technical stability	−0.01	0.82	.01	−.04									
4. Entry threat	0.00	0.81	.08	−.01	.03								
5. Resource tension	0.00	0.81	.01	.00	.01	.07							
6. Product differentiation	0.00	1.00	−.15	.05	−.01	−.02	−.07						
7. Marketing differentiation	0.00	1.00	.16	.22	.03	−.18	−.13	.00					
8. Focus	0.00	1.00	.03	.20	−.22	.00	−.24	.00	.00				
9. Overall cost leadership	0.00	1.00	.08	.35	.22	−.03	.02	.00	.00	.00			
10. Return on assets	−0.04	8.77	.10	.18	.17	−.12	−.21	.03	.31	.24	.40		
11. Return on equity	18.65	45.67	.08	.15	.29	.00	−.12	.16	.11	.01	.40	.77	
12. Sales growth rate	35.52	86.11	−.01	.33	.10	.18	.23	.14	.17	−.04	.28	.06	.18

[a] Correlations greater than .24 are significant at $p < .05$.

TABLE 5
Characteristics of the Four Environmental Settings Derived from Cluster Analysis[a]

Variables	Environmental Settings[b] 1. Weak Bargaining Power	2. Competitive Market	3. Strong Bargaining Power	4. Technically Dynamic	Duncan Multiple Range Tests 1–2	1–3	1–4	2–3	2–4	3–4	F^c
Degree of competition	−.276	1.934**	−.237	−.218	**	n.s	n.s	**	**	n.s	31.7**
	(.40)	(.83)	(.50)	(.60)							
Bargaining power	−.491 **	−.311	1.239 **	−.255	n.s	**	n.s	**	n.s	**	30.5**
	(.57)	(.74)	(.36)	(.55)							
Technical stability	.296*	.235	−.050	−1.744**	n.s	n.s	**	n.s	**	**	25.4**
	(.54)	(.58)	(.33)	(.68)							
Entry threat	.066	.225	−.034	−.438	n.s	n.s	n.s	n.s	n.s	n.s	0.8
	(.74)	(.91)	(.89)	(.79)							
Resource tension	.008	.124	.322	−.816*	n.s	n.s	*	n.s	*	**	3.1*
	(.82)	(.81)	(.51)	(.91)							
Number of cases[d]	26	6	13	6							

[a] Means are reported; standard deviations are in parentheses.

[b] Difference between total sample mean and mean in each cell tested using *t*-tests. Sample mean and cell mean are standardized for purposes of testing.

[c] Values are derived from ANOVA analysis.

[d] $n = 51$.

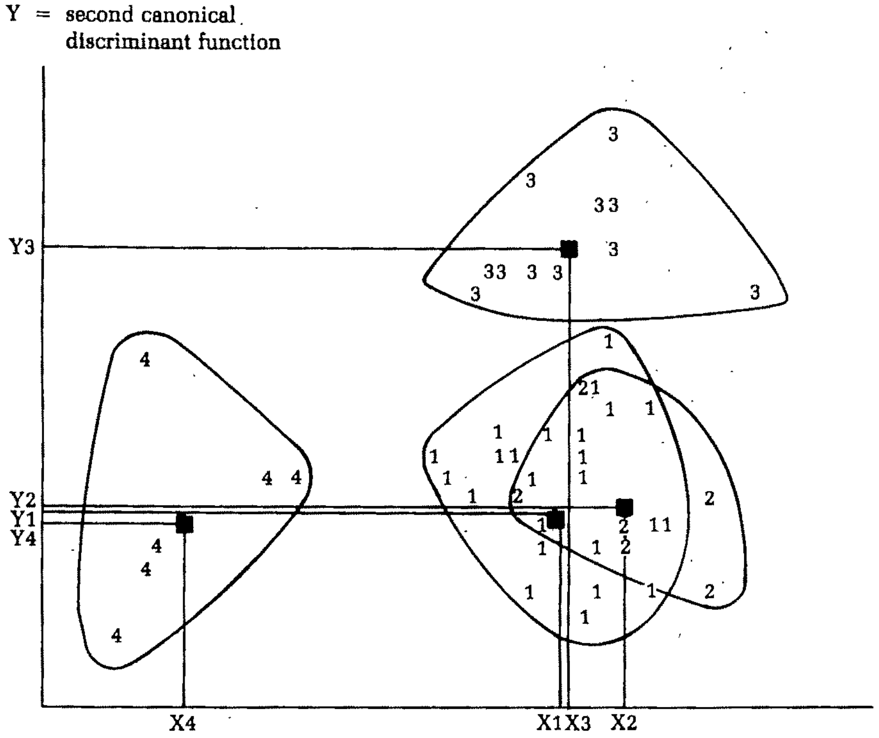
* $p < .05$, *t*-test.

** $p < .01$, *t*-test.

ported the categorization. For example, the second cluster is significantly different from the other clusters in terms of degree of competition, and the third cluster is significantly different from the other clusters in terms of bargaining power. Similarly, the fourth cluster is significantly different from the other clusters in terms of technical stability. The first cluster is not as well defined as the other clusters, as it is not particularly associated with any of the environmental factors. In short, the empirical results show that top managers perceive multiple environmental settings within an industry at the four-digit SIC level in a rapidly developing country, answering the first research question negatively.

The results of the multiple discriminant analysis offer additional insights worth mentioning. The first two canonical discriminant functions account for 86.86 percent of the total variance in the variables. The third function has little discriminating power. A standardized canonical discriminant function coefficient matrix shows that in the first function, technical stability is the most dominant variable that discriminates the four groups, as Figure 1 shows graphically. In the figure, the first function separates the last

FIGURE 1
Scatterplot of the Four Environmental Settings[a]



[a] ■ indicates a group centroid.

group (the technically dynamic environment) from the three other groups (the technically stable environments). Bargaining power is the most powerful variable in the second function, and it discriminates the third group (the strong bargaining power environment) from the rest (the weak bargaining power environments). This pattern shows that the perceived environments of the 54 firms studied can be classified primarily by only two variables: technical dynamism and bargaining power.

Table 6 reports the results of the factor analysis of strategy variables. We reduced the 15 variables to four factors that accounted for 70.8 percent of the total variance. The factor structure here is not as clean as that shown in Table 3. Three of the four factors reflect Porter's (1980) generic strategies—overall cost leadership, product differentiation, and focus. The remaining factor reflects marketing differentiation along the lines suggested by Miller (1986). The first factor has seven variables whose factor loadings are higher than .40. The four most highly loaded variables in the first factor reflect the characteristics of product differentiation that Porter suggested, but the factor also includes strategies of marketing differentiation and scale economy. The second factor appears to concentrate primarily on marketing differentiation. The third factor has five variables with factor loadings above .40, three of which also cross-load with other factors. A special feature of this factor is that it emphasizes high quality and new product development with a high-caliber work force for a specialized market but does not emphasize product differentiation, thus exhibiting the general characteristics of a focus strategy. Similarly, the fourth factor has six variables with high factor loadings. Of the six, the three most highly loaded are associated with a cost leadership strategy. But other highly loaded variables indicate that cost leaders also employed other strategies, as Miller and Friesen (1986a) found in their study of consumer durable industries. We subsequently used the factor scores of these four factors rather than the 15 strategy variables to develop the taxonomy of strategic groups.

The cluster analysis of the four strategy dimensions resulted in four strategic groups. We also validated these results, which appear in Table 7, in two ways. Results from ANOVA and Duncan multiple range tests were satisfactory, showing significant differences in the means of factor scores for each cluster. The validation results of a multiple discriminant analysis showed that a total of 96 percent of the cases were correctly classified into their original clusters.

Table 7 shows that firms in the first strategic group have negative mean scores in all four of the strategic dimensions, indicating that they employed those strategies less than other firms in the sample. That profile fits Porter's (1980) stuck-in-the-middle category. The stuck-in-the-middle firm attempts all the other strategies delineated in this study to a limited degree, but since it pursues none wholeheartedly, it fails to achieve any of them fully (Porter, 1985). The second strategic group consists of firms whose dominant strategy was overall cost leadership. They show statistically significant and high positive values in overall cost leadership but negative values in product

TABLE 6
Varimax-rotated Matrix of Strategy Variables

	Factors			
Variables	Product Differentiation	Marketing Differentiation	Focus	Overall Cost Leadership
Product differentiation	**.732**	.343	.197	.179
New product development	**.687**	.294	.353	.163
High-price product	**.777**	.182	.163	.132
Acquiring high-caliber work force	**.507**	−.037	**.524**	**.483**
Marketing by credit and discount	.270	**.769**	−.077	.117
Extension of market channel	.165	**.723**	.208	**.429**
Advertising	**.412**	**.644**	.263	−.003
Marketing differentiation	**.412**	**.534**	.016	.316
Emphasis on specialized market	.001	**.624**	**.503**	.064
Image building of firm and product	.313	.154	**.753**	.253
After service	.118	.119	**.801**	.084
High product quality	.304	.126	**.691**	**.434**
Operating efficiency	.193	.132	.312	**.770**
Procurement of raw materials	−.031	**.447**	.186	**.707**
Economy of scale	**.497**	.100	.084	**.682**
Eigenvalues	7.002	1.500	1.097	1.027
Percent of cumulative variance	46.7	56.7	64.0	70.8

differentiation and marketing differentiation strategies. Firms in the third group relied primarily on marketing differentiation strategies, with little emphasis on either product differentiation or cost leadership. The dominant strategy of the fourth strategic group was product differentiation. The mean scores on the other strategies are not much different from the mean score of the total sample, which is zero. Firms in this group employed various strategies at the average level but emphasized product differentiation. The results of Duncan multiple range tests also support the clusters identified here.

Not surprisingly, most of the firms in this study employed a product differentiation strategy, reflecting the nature of the industry under study and its relationship with the international market. The electronics industry produces many differentiated products. Furthermore, many firms manufacture what are called original equipment manufacturer products, whose specifications are provided by buyers. Such a strategy results in a high number of differentiated products.

In short, there are multiple strategic groups in the electronics industry in Korea, and their characteristics are largely consistent with the concept of generic strategies developed in the United States and Canada, answering the second research question positively. In the analysis of attributes (see Table 6), the focus strategy emerged as a distinct concept, but in the cluster analysis of firms, the concept disappeared, as no firm appeared to rely heavily on the strategy. An alternative interpretation is that all the firms were using the focus strategy, thus resulting in no significant difference. Instead, the stuck-

TABLE 7
Characteristics of the Four Strategic Groups Derived from Cluster Analysis[a]

	Strategic Groups[b]				Duncan Multiple Range Tests						
Variables	1. Struck in the Middles	2. Overall Cost Leaders	3. Marketing Differentiators	4. Product Differentiators	1–2	1–3	1–4	2–3	2–4	3–4	F[c]
Product differentiation	−.482	−.784*	−1.108*	.594**	n.s	**	n.s	**	n.s	**	17.0**
	(.78)	(.63)	(.97)	(.63)							
Marketing differentiation	−1.542**	−.771*	1.225**	.167	*	**	**	**	**	**	27.0**
	(.48)	(.51)	(.44)	(.69)							
Focus	−1.016	.660	−.075	.071	**	*	n.s	n.s	n.s	n.s	3.6*
	(1.46)	(.91)	(.44)	(.89)							
Overall cost leadership	−.604	1.374**	−.077	−.185	**	n.s	n.s	**	**	n.s	7.7*
	(.73)	(.18)	(1.17)	(.84)							
Number of cases[d]	6	7	8	29							

[a] Means are reported; standard deviations are in parentheses.

[b] Difference between total sample mean and mean in each cell tested using t-tests. Sample mean and cell mean are standardized for purposes of testing.

[c] Values are derived from ANOVA analysis.

[d] $n = 50$.

* $p < .05$, t-test.

** $p < .01$, t-test.

in-the-middle strategy emerged as a strategic group that appeared to employ none of the distinct strategies delineated in this study.

To examine the distribution of strategic groups across environmental settings, we developed the matrix that appears in Table 8. The matrix shows that multiple strategic groups exist in each of the four environmental settings, though some of them have so few cases that they should be viewed as deviants from the main clusters rather than separate strategic groups. The six stuck-in-the-middle firms are all in the first environmental setting. The seven overall cost leaders are distributed evenly in the first three environmental settings. The product differentiators that account for most of the firms in this study appeared in all four environmental settings. As for the marketing differentiators, there are three in the first and three in the third setting and one in each of the other two settings.

TABLE 8
Environment-Strategy Configurations and Performance

	Environmental Settings				
Strategic Groups[a]	**Weak Bargaining Power**	**Competitive Market**	**Strong Bargaining Power**	**Technically Dynamic**	**Totals**
Stuck in the middles					
n	6				6
ROA	−9.4				−9.4
ROE	−12.6				−12.6
SGR	11.4				11.4
Overall cost leaders					
n	2	2	3		7
ROA	−1.8	3.0	3.5		1.9
ROE	−7.0	6.9	95.3		31.7
SGR	48.9	−1.6	20.4		22.6
Product differentiators					
n	15	3	7	4	29
ROA	0.3	3.9	2.7	−0.2	1.3
ROE	26.9	51.8	11.9	−6.6	23.2
SGR	17.5	3.7	64.7	29.1	30.7
Marketing differentiators					
n	3	1	3	1	8
ROA	1.6	−1.5	2.1	−0.9	1.0
ROE	−4.0	−3.9	47.2	−23.8	9.8
SGR	−3.9		220.0	−8.8	84.7
Totals					
n	26	6	13	5	50
ROA	−2.1	2.7	2.8	−0.3	−0.04
ROE	11.8	27.6	35.6	−12.3	18.7
SGR	17.6	1.6	86.9	16.5	35.5

[a] ROA = return on asset; ROE = return on equity; SGR = annual sales growth rate. Values given for ROA, ROE, and SGR are percentages.

To explore the performance implications of environment-strategy configurations, Table 8 also presents the results for the three financial performance indicators measured. In the absence of statistical tests and a useful theory on environment-strategy-performance relations, the performance results are intended to be descriptive and suggestive.

At the aggregate level, we examined strategy and performance across different environmental settings. The last column in Table 8 shows that firms emphasizing a strategy of overall cost leadership outperformed the rest in both ROA and ROE and firms emphasizing the marketing differentiation strategy outperformed the others in terms of sales growth rate. Firms emphasizing the product differentiation strategy did not perform as well as overall cost leaders in terms of either ROA and ROE, yet they still performed well above the industry average, and their sales growth rate was far higher than that of the cost leaders. Those stuck in the middle were underperformers on every measure. Both ROA and ROE were negative, and their sales growth rate was less than one-third the industry average.

At the disaggregate level, strategy and performance were scrutinized within each of the four environmental settings in order to identify a contingency relationship among environment, strategy, and performance. In the weak bargaining power environmental setting, overall cost leaders outperformed others in sales growth, whereas firms with the product differentiation strategy outperformed the rest in ROE and just trailed the marketing differentiators in ROA. Firms classified as stuck-in-the-middle performed less well than the rest in every measure, and the marketing differentiators performed well only in ROA. In the competitive market setting, firms emphasizing the product differentiation strategy outperformed other firms on all three financial measures, and those relying on either the overall cost leadership strategy or the marketing differentiation strategy scored significantly below the setting's average, except for the cost leader's ROA, which was slightly above the average. In contrast, in the strong bargaining power settings, firms emphasizing an overall cost leadership or a marketing differentiation strategy performed well. The former scored well in both ROA and ROE, and the latter did well in growth rate. Firms using the product differentiation strategy did, however, perform poorly in this environmental setting. Finally, all firms in the technically dynamic environmental setting performed poorly. Firms using the product differentiation strategy showed a moderate growth rate, but their performance was still below the industry average. In short, product differentiators performed well in the first and second environmental settings; cost leaders performed well in the third environmental setting; and no firm did well in the fourth environmental setting. The results on strategy-environment relations and performance answer the third research question.

SUMMARY AND DISCUSSION

Theoretical conceptualization and empirical research in strategic management, particularly the development of midrange theories, have recently flourished in developed economies. Such theories suffer from limited external validity because they are mainly based on data from stable or declining industries in the United States. Focusing on a high-growth industry in a rapidly developing country, Korea, this study undertook multivariate analyses to derive taxonomies for both environmental settings and strategic groups and explored environment-strategy-performance relations. Though several idiosyncracies of developing economies emerged from the findings of this study, the findings are to a large extent consistent with the theories developed for industrialized economies.

This study demonstrated that a taxonomic approach to examining the relationship between task environment and strategy may be fruitful even for a developing economy. Although students of organization in developing economies can benefit greatly from the organizational literature grounded in industrialized economies for deductive conceptualizations, they can significantly contribute to the development of organization and management theories by inductively incorporating local idiosyncratic situations into the conceptualization, thereby testing external validity and revising and extending existing theories.

Specifically, this study provided empirical evidence that multiple perceived environments existed in a single industry when environment was perceptually measured. Identifying the multiple perceived environments and their characteristics heightens understanding of the strategic behavior of firms within a single industry. Thus, it is necessary to discuss environmental heterogeneity before relating perceived environment to other organizational variables.

The generic strategies identified in this study largely reflect those developed in industrialized countries. Differentiation, overall cost leadership, and focus were present in the factor analysis of strategic elements, but not as the pure types discussed by Porter (1980). Differentiators in this study also employed cost leadership strategies, and cost leaders employed significant elements of differentiation. This finding is consistent with those of Miller and Friesen (1986a, b). In the cluster analysis, the focus strategy submerged and the stuck-in-the-middle strategy emerged. Furthermore, the differentiation strategy also had two variations—product differentiation and marketing differentiation—in this study. This pattern is consistent with Miller's (1986, 1987) findings.

Organizational theory has established several dimensions of organizational environment: uncertainty, directness, change, dynamism, homogeneity, complexity, and munificence (Aldrich, 1979; Duncan, 1972; Ford & Slocum, 1977; Jurkovich, 1974; Tung, 1979). With limited exceptions (Duncan, 1972; Tung, 1979), such dimensions have not been put to an empirical test. This study put forward a new dimension—bargaining power—in addition to dynamism. Previously defined dimensions simply describe the characteristics of a task environment per se, but bargaining power depicts the interactive relations between a task environment and an organization. Porter (1980) used this dimension as one of the central variables in the structural analysis of industries in strategic management. This new dimension also reflects the central theme of resource dependence theory (Pfeffer & Salancik, 1978). More studies are needed to improve the conceptualization of how organizational characteristics interact with a task environment.

As discussed earlier, Korea's business environment is significantly different from that of developed countries. Its economy is rapidly growing, and its environment evolves in a direction that is the reverse of the direction of developed countries (see Kim and Utterback, 1983, for a detailed discussion). However, this study found strategies in response to given perceived environments and their performance implications to be comparable with those of developed countries. The results of this study show that in environments in which firms had weak bargaining power or in which the market was competitive, with some indication of weak bargaining power, firms employing the differentiation strategy outperformed others. Thompson's (1967) theory of organizational rationality implies that the fewer alternatives a firm can maintain in task environment elements, the weaker its bargaining power. Consequently, firms can easily be squeezed in terms of profit margin and find it difficult to have a large market share. In such an environment, Porter (1980) noted, differentiation increases margins, provides insulation against competitive rivalry, and lowers sensitivity to price. In contrast, in an environment in which firms had strong bargaining power, overall cost leaders outperformed others. When a firm has strong bargaining power, it is easy for it to have a large market share and enjoy economies of scale, giving advantages to overall cost leaders. The noticeably high performance by firms using the marketing differentiation strategy may have another cause: aggressive marketing activities may result in significant returns when firms have strong bargaining power in the market.

Why did firms in this study perform poorly in a technically dynamic environment, the fourth environmental setting? Kim (1980a) empirically documented that Korean electronics firms have grown rapidly in the past two decades through the importation, assimilation, and improvement of foreign technologies. The major focus of technological tasks has been on the acquisition of production capability rather than innovation capability (Westphal, Kim, & Dahlman, 1985). But the recent erosion of Korea's competitive advantage in labor-intensive industries, caused mainly by rapid increases in domestic wages and also by the entry of other developing countries into the market, has made it imperative for Korean firms to enter technically more challenging areas (Kim, 1986). Sensing the international market signals, some Korean firms have entered new fields. However, the firms using either the differentiation or the marketing strategy without having adequate innovation capability and technical experience scored poorly in the technically dynamic environment. That conclusion did not emerge directly from the data presented here but from observations of Korean firms made in undertaking a series of research projects over a long period of time.

This study has its own limitations. The first shortcoming is its use of the same three-year period for measures of environment, strategy, and performance; the assumption was that those measures had not changed for some time and that performance reflected the outcome of strategies adopted in a given environment. But if either environment or strategy had changed in recent years, time-lagged effects on performance should have been taken into account. The second shortcoming is the relatively small sample size, which might have led to some instability in the factor analysis. Future research should address those shortcomings.

The findings of our research demonstrate that strategic research in taxonomic approach might be fruitful even in a developing country and that it can help identify theories unique to developing countries and increase the external validity of theories developed in industrialized countries. However, it is essential to examine research questions raised here in different industries in Korea where the environment might be more or less turbulent than in the electronics industry. It is equally essential to undertake similar research in countries less developed than Korea in order to generalize the findings of this study and to develop a contingency theory of strategic management in developing countries.

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APPENDIX

The following is the English translation of the original Korean instruments used in measuring the 13 environmental variables, 15 strategy variables, and 3 performance variables.

Environmental variables. Managers were asked, "To what extent do you agree or disagree with each of the following statements as the description of your operation in your major product-market in the past three years?" (7-point scale, with 1 = strongly disagree and 7 = strongly agree; each firm's major product-market was identified at the outset of discussions with the top management). (1) It has been difficult to procure raw materials for your major product. (2) Buyers have posed a significant threat to you through backward integration. (3) The suppliers have posed a significant threat to you through forward integration. (4) It has not been so difficult to hire qualified technical personnel. (5) Technology has changed rapidly in your major product-market. (6) The price of raw materials and component parts has changed quite frequently. (7) Your distribution channels are above the average in the industry. (8) The degree of your vertical integration is above the average in the industry. (9) You have many alternative sources in acquiring raw materials.

In addition, respondents were asked: (1) "What is the number of competitors in your major product-market?" (2) "What is the number of new entrants in your major product-market in the past-three years?" (3) "What is the number of firms that left your major product-market in the past three years?" (4) "What is the number of competitive products in your major product-market?" To assess any major change in the three-year period 1980–82, we asked: "Have you experienced a major change with respect to any of nine statements in the past three years? Which one? Please state the nature of the change."

Strategy variables. "To what extent has your firm been competitive in your major product-market in the following activities in the past three years?" (7-point scale ranging from 1 = not at all to 7 = a great deal). Product differentiation, new product development, high-price product, acquiring high-caliber work force, marketing by credit and discount, extension of market channel, advertising, market differentiation, emphasis on specialized market, image building of the firm and products, after service, pursuing high product quality, pursuing operating efficiency, pursuing cost advantage in raw material procurement, and pursuing economy of scale. In addition, we asked if any major change had taken place in any of the above activities during 1980–82.

Performance variables. Using published financial statements, we obtained three-year (1980–82) averages for return on assets, return on equity, and sales growth rate.

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CORRECTION

In Keats and Hitt (*Academy of Management Journal*, 31: 570-598) the wrong journal was listed for an article referenced on page 594. The correct information is:

Hitt, M.A., & Ireland, R.D. 1986. Relationships among corporate level distinctive competencies, diversification strategy, corporate structure and performance. ***Journal of Management Studies***, 23: 401–416.

© *Academy of Management Journal*
1988, Vol. 31, No. 4, 828–853.

A CONTINGENCY APPROACH TO STRATEGY IMPLEMENTATION AT THE BUSINESS-UNIT LEVEL: INTEGRATING ADMINISTRATIVE MECHANISMS WITH STRATEGY

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This study focused on what is perhaps the most critical aspect of strategy implementation in large, multibusiness organizations: recognizing that different business units within the same corporation often pursue different strategies and that the administrative mechanisms that corporate headquarters use to manage those businesses should differ. This study compared the results of bivariate and systems approaches to fit. Implications of the results for theory development and managerial practice are discussed.

It is currently accepted in the strategic management literature that diversified corporations segment themselves into several strategic business units (SBUs) and typically assign different strategies to the individual SBUs (Henderson, 1979; Porter, 1980; Rothschild, 1979). One implication of such a practice is that the chief executive of a diversified firm has to implement multiple strategies within the same firm. Most of the prior research studies on the management of diversified firms have addressed only the subject of strategy formulation and not that of its implementation. The concern, therefore, has been only with how appropriate strategic choices are made for various businesses (Miles & Snow, 1978; Porter, 1980). Limited research attention has focused on the design of differentiated administrative systems that can facilitate the implementation of the variety of SBU strategies being pursued by diversified corporations. It is this broad topic that is the subject matter of this study.

An overall model of strategy implementation was developed, based on the following set of arguments: (1) The strategy chosen by an organization determines to a large extent the uncertainty with which the organization

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must cope (Chandler, 1962; Gupta & Govindarajan, 1984a; Miles & Snow, 1978). (2) Different administrative mechanisms are available to help organizations cope with uncertainty (Galbraith, 1973; Lorsch & Allen, 1973; Lorsch & Morse, 1974; Tushman & Nadler, 1978). (3) Thus, matching administrative mechanisms with strategy is likely to be associated with superior performance.

Prior research supports the notion that there is a strong association between strategic choice and level of uncertainty. Here, the notion of uncertainty includes dimensions of both unpredictability and complexity (Lawrence, 1981). Chandler (1962) argued that the greater a firm's product-market diversity, the greater would be the environmental complexity and the resultant uncertainty for the firm. Miles and Snow (1978) found that units following a prospector strategy faced a more unpredictable and uncertain task environment than units following a defender strategy. Govindarajan (1986b) argued that build strategies are associated with greater unpredictability and uncertainty than harvest strategies. More recently, Gupta (1987) argued that the choice of a differentiation strategy rather than a low-cost strategy would increase the uncertainty in a focal unit's task environment, with the uncertainty arising out of both unpredictability and complexity.

It follows that coping with uncertainty is the fundamental problem in effectively implementing strategies (March & Simon, 1958; Thompson, 1967). Past studies have identified three key administrative mechanisms that firms can use to cope with uncertainty: design of *organizational structure* (Chandler, 1962; Galbraith, 1973; Tushman & Nadler, 1978), design of *control systems* (Hayes, 1977; Hirst, 1983; Lorsch & Allen, 1973), and selection of *managers* (Gupta & Govindarajan, 1984a; Lorsch & Morse, 1974; Miller, Kets de Vries, & Toulouse, 1982). Studies linking organizational structure to uncertainty have used information processing as a mediating variable (Ford & Slocum, 1977; Tushman & Nadler, 1978). The literature on control systems has expressed the view that as tasks vary in uncertainty, the behaviors necessary for effective performance also vary; further, since different control systems induce different behaviors, superior performance can best be achieved by tailoring control systems to task uncertainty (Govindarajan, 1984; Hayes, 1977; Hirst, 1983). Studies on managers have found that different managerial characteristics are systematically related to organizational requirements for dealing with different levels of uncertainties and contingencies in task environments (Gupta & Govindarajan, 1984a; Lorsch & Morse, 1974).

Thus, matching strategy with organizational structure, control systems, and managers' characteristics is expected to be associated with superior performance. As a preliminary test of this model at the SBU level, this study examined how to differentiate three administrative mechanisms—budget evaluative style, a control system variable; decentralization, an organizational structure variable; and the locus of control of an SBU's general manager, a managerial-characteristic variable—in accordance with differences in SBU competitive strategies.

A few studies have examined effective ways to implement diverse strategies at the SBU level (Govindarajan & Gupta, 1985; Gupta & Govindarajan, 1984a,b). Although building on those studies, this study made several new contributions to that line of research. First, prior studies have focused on either managerial selection (Gupta & Govindarajan, 1984a) or control systems design (Govindarajan & Gupta, 1985). This study took an integrated look at important elements of all three key administrative mechanisms: organizational structure, control systems, and managers. Second, prior studies have examined the need to tie administrative mechanisms to the mission of a business unit, usually expressed in terms of building, holding, or harvesting market share. This study examined the implications of matching administrative mechanisms to the competitive strategy being followed by a business unit. Finally, unlike prior studies that have exclusively used bivariate analyses, this study also included multivariate analyses that examined the joint linkage between the three administrative mechanisms and strategy.

CHARACTERIZING COMPETITIVE STRATEGY AND ADMINISTRATIVE MECHANISMS

Competitive Strategy

This study used Porter's (1980) strategy framework, since that conceptualization is academically well accepted and internally consistent (Dess & Davis, 1984; Hambrick, 1983). Porter (1980, 1985) identified two generic ways in which an SBU can gain a sustainable competitive advantage over other firms in its industry: "low cost" and "differentiation." A low-cost strategy emphasizes the need to incur the lowest costs in an industry; Commodore exemplifies this strategy in business machines. This strategy requires "aggressive construction of efficient-scale facilities, vigorous pursuit of cost reductions from experience, tight cost and overhead control, avoidance of marginal customer accounts and cost minimization in area like R&D, service, sales force, advertising, and so on" (Porter, 1980: 35). In a differentiation strategy, a firm seeks to be unique in its industry along dimensions that are widely valued by buyers; Mercedes exemplifies this strategy in automobiles. Under this strategy, a firm "selects one or more attributes that many buyers in an industry perceive as important, and uniquely positions itself to meet those needs. It is rewarded for its uniqueness with a premium price" (Porter, 1985: 14).

The fact that an SBU is pursuing a low-cost strategy does not imply that it can ignore quality, service, features, or other bases for differentiation. Similarly, an SBU pursuing a differentiation strategy cannot ignore costs. To quote Porter: "[A strategy of differentiation] does not allow the firm to ignore costs, but rather they are not the primary strategic target" (1980: 37) and "[A strategy of low cost implies that] low cost relative to competitors becomes the running theme through the entire strategy, though quality, service, and other areas cannot be ignored" (1980: 35). Thus, following Porter, I measured competitive strategy in terms of SBUs' intended trade-offs between becoming the cost leader and achieving differentiation.

Administrative Mechanisms

Budget evaluative style. The focus on budget evaluative style is highly relevant, given the central place performance evaluation systems occupy in the accounting and control literature (Govindarajan, 1984; Hayes, 1977; Hirst, 1983; Hopwood, 1972; Otley, 1978). SBU general managers' performance can be evaluated on the basis of several types of data, both quantitative and qualitative. This study focused on the role played by one such type of data—the profit budget. A profit budget represents the annual profit goals (sales revenues less expenses) of an SBU expressed in monetary terms. Following Otley (1978), I viewed budget evaluative style as a continuous variable whose values depend on the amount of emphasis that meeting budgetary goals receives during the ongoing process of evaluating the performance of an SBU's general manager. At one end of the spectrum are situations in which budgetary information plays a relatively unimportant part in a superior's evaluation of an SBU general manager's performance. At the other end are situations in which an SBU general manager's performance is primarily evaluated on the basis of ability to continually meet the budget and in which the manager receives an unfavorable performance evaluation if unfavorable budget variances occur, regardless of any mitigating circumstances.

Decentralization. Previous research supports the choice of decentralization as an important structural mechanism to facilitate effective strategy implementation (Chandler, 1962; Rumelt, 1974; Vancil, 1980). Following Ford and Slocum (1977), I viewed decentralization as the amount of decision-making authority that is delegated to an SBU's general manager by corporate superiors. Decentralization between a corporate office and general manager was considered, but decentralization within an SBU was not considered.

Locus of control. Prior research suggests that the association between a general manager's locus of control and strategy holds much promise for explaining organizational performance (Miller et al., 1982; Miller & Toulouse, 1986). The underlying concept, that of internal versus external control of reinforcement, has evolved out of social learning theory (Rotter, 1966). Internal control refers to an individual's perceiving events, whether positive or negative, as a consequence of his or her own actions and thereby as potentially under personal control. External control refers to perceiving positive and negative events as unrelated to personal behavior and therefore beyond personal control.

THEORETICAL BACKGROUND AND HYPOTHESES

Relating Competitive Strategy to Uncertainty

Govindarajan (1986b) and Gupta (1987) supplied the following theoretical arguments in support of the position that the choice of a differentiation strategy rather than a low-cost strategy would increase uncertainty in an SBU's task environment. First, product innovation is likely to be more critical for SBUs employing a differentiation strategy than for those employing a low-cost strategy (Dess & Davis, 1984; Hambrick, 1983; Porter, 1980). That is partly because a low-cost SBU, with its primary emphasis on cost reduction, prefers to keep its product offerings stable over time, whereas a differentiation SBU, with its primary focus on uniqueness and exclusivity, is likely to engage in product innovation. As Biggadike (1979) found, an SBU with a strong emphasis on new product activities will face high uncertainty since it is betting on products that have not yet crystalized.

Second, SBUs employing a low-cost strategy typically tend to have narrow product lines in order to minimize inventory carrying costs as well as to benefit from scale economies (Gupta, 1987; Hambrick, 1983; Porter, 1985). On the other hand, SBUs employing differentiation tend to have a broad set of products in order to create uniqueness (Hambrick, 1983; Gupta, 1987). Previous researchers have argued that product breadth is associated with high environmental complexity and, consequently, with uncertainty (Chandler, 1962; Gupta, 1987).

Budget Evaluative Style

The greater the uncertainty, the more difficult it is for superiors to regard their subordinates' budget targets as firm commitments and consider unfavorable budget variances as clear indicators of poor performance (Govindarajan, 1984; Hayes, 1977; Hirst, 1983; Keeley, 1977). There are several reasons: (1) To arrive at a priori budget targets that can serve as valid standards for subsequent performance appraisal, an individual must be able to predict the conditions that will exist during a coming year. It is possible to predict those conditions more accurately under stable environmental conditions than under uncertain environmental conditions (Galbraith, 1977: 36). Thus, given high uncertainty, managers are likely to be motivated and might react in dysfunctional ways when forced to meet budgetary goals. (2) Efficiency refers to amount of input per unit of output (Anthony, Dearden, & Bedford, 1984). An evaluation of managerial efficiency using a budget would, therefore, depend on a detailed knowledge of outcomes associated with given managerial actions or, in other words, knowledge of cause-effect relationships. Thompson (1967) argued that complete knowledge of cause-effect relationships exists under stable conditions and incomplete knowledge exists under uncertain conditions. (3) The emphasis of a budget is on outcome rather than on process. Managers may have control over their actions but not over the circumstances that combine with their actions to result in outcomes. In a situation with high uncertainty, budget information alone would not, therefore, adequately reflect managerial performance.

The link between budget evaluative style and uncertainty, in the context of the link between uncertainty and competitive strategy, led to the following hypothesis:

> *Hypothesis 1: For SBUs employing a strategy of differentiation, deemphasizing budgetary goals during performance evaluations is likely to be associated with high SBU effectiveness. For SBUs employing a strategy of low cost, emphasizing budgetary goals during performance*

> *evaluations is likely to be associated with high SBU effectiveness.*

The following additional arguments, not related to uncertainty, also support Hypothesis 1: (1) Most of the factors that make an SBU pursuing a strategy of differentiation successful cannot be fully captured by a budget. Such factors are generally difficult to quantify in any type of meaningful way because their benefits are not only difficult of quantify, but often even difficult to identify. For example, many SBUs pursuing differentiation are very successful because they are known for producing the highest-quality products available. Certainly the costs required to achieve such a level of quality can be determined. However, the benefits that accrue to an SBU because of its reputation are difficult to measure, except to say that without its quality image, the SBU would probably not be enjoying a position of profitability and growth. Brand image and rapid delivery would also fall in this category. (2) Amounts spent on differentiating factors (advertising, high quality, fast delivery, product R&D, etc.) have generally been categorized as discretionary expenditures and are usually the first victims of cost-cutting measures. To tightly hold an SBU manager to budgetary goals is to place such factors at risk (Hayes & Abernathy, 1980; Richardson & Gordon, 1980; Sata & Maidique, 1980). (3) Low-cost SBUs generally have lower margins than differentiation SBUs and make their profit on volume rather than on high profit margins. Those conditions imply that low-cost producers have very little room for error. Managers of such SBUs must, therefore, be encouraged to meet their budgets.

Decentralization

Prior research has found that high decentralization is an appropriate response to increased uncertainty (Burns & Stalker, 1961; Galbraith, 1973; Govindarajan, 1986a; Lawrence & Lorsch, 1967; Tushman & Nadler, 1978). According to that line of research, as a task environment becomes more uncertain, there will be need for more information. Centralization is possible at low levels of uncertainty because the information processed does not overburden an organization's hierarchy. However, as uncertainty increases, more exceptions arise that must be referred upward in the hierarchy. As more exceptions are referred upward, the hierarchy becomes overloaded. Serious delays develop between the upward transmission of information about new situations and a response to that information downward. An effective way to deal with such a situation is to move the level of decision making to where information exists rather than to bring it upward in the hierarchy, suggesting decentralization in decision making as a response to increased uncertainty. Thus,

> *Hypothesis 2: For SBUs employing a strategy of differentiation, increase in decentralization is likely to be associated with high SBU effectiveness. For SBUs employing a strategy of low cost, increase in centralization is likely to be associated with high SBU effectiveness.*

The following argument, not rooted in uncertainty, provides additional support for Hypothesis 2. Gupta and Govindarajan (1986b) found that interdependence with other business units was more beneficial for a low-cost SBU than for a differentiation SBU, since sharing activities helps to minimize overall cost, which is more critical for a low-cost unit. Prior research has concluded that with high degrees of interdependence, centralized decision making improves performance because the effects that one manager's decisions have on the performance of other units lead to the need for effective coordination and joint problem solving (Lorsch & Allen 1973; Thompson, 1967; Vancil, 1980).

Locus of Control

Results from two groups of studies have led to the conclusion that people with an internal locus of control perform better than those with an external locus of control under conditions of high uncertainty. The first group of studies deals with an individual's ability to acquire and use information. In particular, they have found that (1) people with an internal locus seek task-relevant information more actively than those with an external locus (Davis & Phares, 1967; Organ & Greene, 1974; Pines & Julian, 1972) and (2) the first group is more efficient in the utilization of information than the second (Phares, 1968; Spector, 1982; Wolk & DuCette, 1974). The logic behind the greater information processing capability of people with an internal locus is based on the presumed construct properties of the internal-external dimension. People with an internal locus, having a high generalized expectancy that rewards are a function of their own efforts, should seek task-related information actively and use that information well, since they are likely to see acquisition and utilization of relevant information as a pathway toward reinforcement. People with an external locus, on the other hand, possessing the generalized expectancy that their own efforts are not crucial in attaining rewards, would not actively seek and use information. Galbraith (1973) argued that the greater the uncertainty, the greater the amount of information that has be be processed. Thus, individuals with an internal locus can be expected to deal with uncertainty more effectively than those with an external locus.

The second group of studies (Anderson, Hellriegel, & Slocum, 1977; Gore & Rotter, 1963; Mitchell, Smyser, & Weed, 1975) addresses the relationship between uncertainty and locus of control more directly by providing evidence that those with an internal locus of control adapt to environmental changes better than those with an external locus. Thus,

> *Hypothesis 3: For SBUs employing a strategy of differentiation, greater internal locus of control on the part of an SBU general manager is likely to be associated with high SBU effectiveness. For SBUs employing a strategy of low cost, greater external locus of control on the part of an SBU general manager is likely to be associated with high SBU effectiveness.*

Systems Approach to Fit

The first three hypotheses are of the bivariate interaction type. That is, each focuses on the relationship between competitive strategy and one specific administrative mechanism and their interactive effects on performance. In addition to such bivariate analyses, multivariate analyses that examine the *joint* linkage between administrative mechanisms and strategy are useful. I chose to use bivariate as well as systemic interactions since, as Drazin and Van de Ven (1985) argued, those two approaches provide both unique and complementary information. Exclusive reliance on either approach is likely to result in loss of information.

Given the theoretical arguments advanced in support of Hypotheses 1,2, and 3, it follows logically that if an SBU has appropriately matched all three administrative mechanisms simultaneously to its strategy, it will operate at higher levels of effectiveness than otherwise. The following hypothesis captures this systems approach to fit.

> *Hypothesis 4: An appropriate match of all three key administrative mechanisms (budget evaluative style, decentralization, and locus of control) with strategy will be associated with high SBU effectiveness. A mismatch will be associated with low effectiveness.*

Figure 1 summarizes the nature and form of the four contingency hypotheses tested in this study. Previous studies have indicated that differences in performance are associated with differences in subunit size (Cummins & King, 1973) as well as with differences in firm size (Weiner & Mahoney, 1981). Thus, I tested all hypotheses after controlling for the confounding effects of firm and SBU size on performance.

FIGURE 1
Contingency Hypotheses Tested

Approach	Nature of Relationship Hypothesized	Form of the Hypotheses
Bivariate interaction approach	One administrative mechanism →SBU performance SBU competitive strategy	Hypotheses 1, 2, and 3 focus on the relationship between competitive strategy and one specific administrative mechanism (budget evaluative style, decentralization, or locus of control) and their interactive effects on performance.
Systems approach to fit	Multiple administrative mechanisms →SBU performance SBU competitive strategy	Hypothesis 4 argues that performance is a function of the interaction between competitive strategy and the system of multiple administrative mechanisms (budget evaluative style, decentralization, and locus of control).

METHODS

Data were collected from SBU general managers and their superiors at 24 firms on the *Fortune* 500 list (sales range: $450 million to $37 billion). The firms represented both growing and mature industries, including the automotive, petroleum, food products, chemical production, aerospace, electronics, consumer durables, clothing manufacture and retail, and various consumer nondurables industries.

A questionnaire was the principal means of data collection. The questionnaire was developed and refined on the basis of several sources; (1) field interviews with corporate-level executives in 14 *Fortune* 500 firms (none of which were included in the final study) to identify the salient issues, (2) review of previous research to locate questionnaire instruments appropriate for this study, (3) discussions of the preliminary drafts of the questionnaire with scholars, to assess content validity, and (4) pretesting the questionnaire with ten SBU managers for clarity and relevance.

The chief executive officer of each of the 24 firms designated a contact person[1] who selected about six SBUs for participation in the study and ensured that a mix of SBU strategies was represented and that each SBU's general manager had held that position for at least one year. Cover letters from me and from the contact executives were sent explaining the purpose of the study and assuring confidentiality. Respondents received return envelopes with which to send the completed questionnaires directly back to me, in order to minimize response bias. Of the 145 SBU general managers who received questionnaires, 134 (93%) responded, of which 121 (84%) cases were usable (SBUs per firm = 2 – 8). On the average, the respondents were 50 years old, had worked for their present employers for 18 years, and had held their present position for 6 years.

Out of the 121 usable responses, the contact executives provided the names of SBU general managers' superiors for 88 SBUs. I mailed a second questionnaire, a cover letter ensuring confidentiality, and a preaddressed stamped envelope to those individuals. A total of 75 superiors returned the questionnaires for a response rate of 85 percent. SBU general managers' responses were used in data analysis, whereas their superiors' responses were primarily used for testing the validity of the measured variables.

Measurements

The Appendix describes the scales and response formats for the variables measured. Table 1 contains summary statistics as well as the matrix of zero-order correlation coefficients for all variables.

SBU effectiveness. This variable was measured using the instrument developed by Gupta and Govindarajan (1984a,b; 1988b). They measured SBU effectiveness along a multiplicity of dimensions rather than on any single dimension and, in arriving at a measure of overall effectiveness, used the degrees of importance of each dimension for an SBU as weights. Further,

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[1] The contact executives did not serve as respondents.

TABLE 1
Response Structure of All Variables

Variables	Means	s.d.	Zero-Order Correlation Coefficients[a] 1	2	3	4	5	6	Correlations Between Superiors' and Subordinates' Responses[b]	Alpha
1. Effectiveness	4.70	1.03							.60***	.81
2. Competitive strategy[c]	4.63	0.79	.17						.71***	.68
3. Locus of control	18.28	3.98	.02	−.23**						.69
4. Budget evaluative style	2.89	0.91	.12	.10	−.02				.41***	
5. Decentralization	5.87	0.93	.15	.13*	−.01	−.09				.85
6. Company	7.52	1.13	.15	−.22**	.03	−.04	−.18			
7. SBU size	6.51	1.45	.21*	−.03	−.07	−.01	−.02	.50***		

[a] $N = 121$.

[b] Correlations between superiors' and subordinates' responses on the ten individual performance dimensions were positive and significant for (1) the effectiveness ratings, (2) for the most part, the criterion weights, and (3) effectiveness ratings multiplied by criterion weights. $N = 75$.

[c] High = differentiation strategy; low = low-cost strategy.

* $p < .05$

** $p < .01$

*** $p < .001$

they measured effectiveness in the form of a comparison between actual performance and a priori expectations rather than on an absolute scale.

To test for the convergent validity of the effectiveness measure, each superior was asked to rate, on a 7-point Likert scale ranging from "significantly below average" to "significantly above average," the overall performance of a focal subordinate's SBU. As expected, values derived from the effectiveness index, which was based on the SBU managers' responses, correlated positively with superiors' assessments on overall performance ($r = .54$, $p < .001$).

To test for construct validity, each superior was asked to indicate how the incentive bonus awards received by the focal SBU manager compared with the average incentive bonus awards received by the manager's peers during the same period. Responses were obtained on a 7-point Likert scale ranging from "significantly below average" to "significantly above average." As anticipated, values derived from the effectiveness index correlated positively with superiors' responses on this question ($r = .47$, $p < .001$).

Porter's competitive strategy. Since no standard instrument was available for measuring competitive strategy, I developed an instrument based on the conceptual discussion of low-cost and differentiation strategies by Porter (1980, 1985). The construct validity of this variable was assessed by asking respondents to indicate the importance of some key competitive methods to their SBUs' overall strategy. A 5-point Likert scale was used, with values ranging from "not important" to "extremely important." Results were consistent with Porter's (1980) and Dess and Davis's (1984) work: the competitive strategy variable correlated positively with the importance of new product development ($r = .23$, $p <.01$), product quality ($r = .21$, $p < .01$), and brand identification ($r = .25$, $p <.01$) but negatively with the importance of low price ($r = -.26$, $p < .01$).

The convergent validity of Porter's competitive strategy variable was assessed in two ways. First, the superior of each SBU manager was asked to indicate the percentage of the SBU's current sales dollars that was accounted for by products represented by the two competitive strategies of concern. High values on this question indicated differentiation, and low values indicated cost leadership. As expected, superiors' answers on the question correlated positively with values for the competitive strategy variable based on SBU general managers' responses ($r = .46$, $p < .001$). Second, I conducted content analysis of the descriptive parts of the annual report and the 10-K of each company to identify the competitive strategy of each SBU (coded as 1 = pure low cost, 2 = mixed, and 3 = pure differentiation). As anticipated, values for the competitive strategy variable obtained from the SBU general managers correlated positively and significantly with values for the same variable based on the content analysis ($r = .55$, $p < .001$).

Budget evaluative style. This variable was measured using the instrument developed by Hopwood (1972). To test for construct validity, the superior of each SBU manager was asked to agree or disagree on a 7-point Likert scale ranging from "strongly disagree" to "strongly agree" to the following statement: "Your subordinate's salary increases are closely tied to budget performance." As expected, responses on the statement correlated negatively with the variable measuring budget evaluative style ($r = -.27$, $p < .01$).

Locus of control. Rotter's (1966) internal-external scale was used to measure locus of control for SBU general managers. Factor analytic studies of Rotter's scale have generally shown that control beliefs are multidimensional rather than unidimensional (e.g., Cherlin & Bourque, 1974; Gurin, Gurin, & Morrison, 1978; Mirels, 1970). Those researched have differentiated the internal-external scale into several measures of control and argued that the appropriate dimensions should be included in specific studies.

Of the 29 items contained in the original Rotter's internal-external scale, 6 items are fillers. Three questions referring explicitly to schoolrooms and teachers were excluded as inappropriate for general managers. I also excluded 5 items uncovered by Mirels (1970) and by Gurin and colleagues (1978) that focus on a respondent's acceptance or rejection of the idea that a citizen can exert control over political and world events, since responses to those items would be highly contingent on a respondent's opinions about prevailing social institutions—opinions not relevant for this study. Finally, 4 questions identified by Gurin and colleagues (1978) as relating to interpersonal control did not seem appropriate for this study.

Each manager was administered the resulting 11-item Rotter internal-external scale. The items focused on a respondent's inclination to assign greater or lesser importance to ability and hard work than to luck as influences that determine personally relevant outcomes. Here, both internal and external statements focused on the individual—as opposed to the social system—as the target of control. Responses to the 11 items were summed to form a total internal-external control score, with high values indicating an internal locus of control and low values indicating an external locus of control.

Decentralization. This variable was measured using the instrument developed by Vancil (1980).

Additional Reliability and Validity Tests

In addition to the reliability and validity tests reported in the preceding section, correlations were computed between superiors' and subordinates' ratings on given variables. Anything approaching perfect correlation would, of course, be unlikely because of selective perception, but a reasonable relationship would tend to establish the convergent validity of the measures employed. All the correlations were positive, as expected, and all were significant at the .001 level or better (Table 1).

Further, internal reliability estimates (Cronbach's alphas) for all the multiitem measures were calculated (Table 1). These reliability values were comfortably above the lower limits of acceptability, generally considered to be around .50 to .60 (Nunnally, 1978).

RESULTS

Bivariate Interaction

Following the arguments of Southwood (1978) and Gupta and Govindarajan (1986a) and using an approach similar to that taken by Schoonhoven (1981), I tested the bivariate interaction hypotheses by estimating a regression equation with a multiplicative interaction term, after controlling for company and SBU size. Table 2 contains the results of the multiple regression analyses undertaken to test Hypotheses 1,2, and 3. Each hypothesis was tested using a set of two regression equations: one without the multiplicative interaction term and a second with the interaction term brought in. As was noted, regression computations were based on the data collected from SBU general managers.

As the data for the first and second equations in Table 2 indicate, the results support Hypothesis 1, which concerns the impact of competitive strategy on the utility of budget evaluative style. The interaction term is positive and significant. Also, introduction of the interaction term brought about a significant increase ($p < .01$) in R^2 or the variance in SBU performance explained.

Results of the third and fourth equations do not support the hypothesized impact of competitive strategy on the utility of decentralization. The interaction term is positive, as expected, but not significant. Thus, Hypothesis 2 is not supported.

Results of the fifth and sixth equations support the expected relationship between competitive strategy and locus of control (Hypothesis 3). As hypothesized, the interaction term is positive and significant. Also, introducing the interaction term brought about a significant increase ($p < .01$) in R^2.

Systems Approach to Fit

The bivariate interaction approach analyzed the fit between SBU strategy and the administrative mechanisms, taking one mechanism at a time. The systems analysis, on the other hand, examined the impact of the fit between the administrative mechanisms, taken as a set, and SBU strategy on SBU effectiveness. I used the methodology first advocated by Van de Ven and Drazin (1985) to test Hypothesis 4.

First, scores on the three administrative mechanisms were standardized (with scores ranging from -1.00 to $+ 1.00$), in order bring all the variables to a uniform scale. Second, theory-based ideal profiles of the administrative mechanisms were developed for low-cost and differentiation subgroups. Van de Ven and Drazin (1985: 350) recommended that ideal type patterns of design variables be generated either theoretically or empirically. I chose to use theory-based ideal profiles for the following reasons: (1) The empirical approach requires certain decisions (e.g., the number of units to be classified as high performers) that might be deemed arbitrary. (2) In order to avoid biasing the statistical results, a researcher must exclude the high-performing units used to calculate the ideal types and an equal number of low-performing

TABLE 2
Results of Multiple Regression Analysis with Effectiveness as Dependent Variable

	Budget Evaluative Style		Decentralization		Locus of Control	
Administrative Mechanisms[a]	**Equation 1**	**Equation 2**	**Equation 3**	**Equation 4**	**Equation 5**	**Equation 6**
Administrative mechanisms	0.086	−1.236**	0.106	−0.654	0.009	−0.246**
	(.096)	(.542)	(.100)	(.642)	(.024)	(.104)
Competitive strategy[b]	0.191	1.045**	0.204	−0.761	0.252*	−0.706
	(.109)	(.361)	(.106)	(.813)	(.115)	(.398)
Company size	0.089	0.086	0.104	0.095	0.063	0.100
	(.090)	(.088)	(.090)	(.090)	(.101)	(.099)
SBU size	0.073	0.090	0.070	0.070	0.065	0.054
	(.069)	(.067)	(.068)	(.067)	(.074)	(.072)
Interaction term[c]		0.291**		0.161		0.056**
		(.117)		(.134)		(.022)
R^2 [d]	.07	.13	.08	.10	.07	.14
F (df)[d]	1.954	2.869**	2.328	2.157	1.832	2.810*
	(4,100)	(5,99)	(4,104)	(5,103)	(4,91)	(5,90)
ΔR^2		.06		.02		.07
F for ΔR^2 (df)		6.13 **		1.433		6.295**
		(1,99)		(1,103)		(1,90)

[a] For the results reported for administrative mechanisms, competitive strategy, company size, SBU size, and interaction term, the numbers reported in parentheses indicated standard errors. All the results (including the significance levels) in these rows vary with changes in the points of origin of the main variables. For details, see Southwood (1978).

[b] High = differentiation strategy; low = low-cost strategy.

[c] For the interaction terms, the values of the unstandardized regression coefficients, their standard errors, and their levels of significance are independent of the points of origin of the main variables. Hence the data do have information content.

[d] The *Fs* and *Rs* for the equations are also independent of the points of origin of the main variables.

* $p < .05$
** $p < .01$
*** $p < .001$

units while computing the correlation between the distance measure and performance. However, that procedure significantly reduces degrees of freedom. (3) The empirical approach requires an a priori assumption that the empirical values approximate the ideal values, which could introduce a logical contradiction. For instance, in Drazin and Van de Ven's (1985) study, of 11 design variables, only 7 had means significantly different across low-, medium-, and high-uncertainty groups. That is tantamount to assuming that, for optimal performance, there is no contingency relationship between the remaining 4 design variables and task uncertainty. To make such an assumption before a contingency hypothesis has even been tested introduces an analytical contradiction in the internal logic of empirically derived ideal profiles.

Table 3 contains the theory-based ideal profiles of the administrative mechanisms, in which the end points on the variables were identified as the

TABLE 3
Ideal Profiles of Administrative Mechanisms for the Low-Cost and Differentiation Subgroups[a]

Administrative Mechanisms	Low-Cost	Differentiation
Budget evaluation style	− 1.00	+ 1.00
Decentralization	− 1.00	+ 1.00
Locus of control	− 1.00	+ 1.00

[a] Scores are standardized.

ideal values for low-cost and differentiation subgroups. Though treating end points of the standardized scale as ideal points has support in the literature on multidimensional scaling (Green & Wind, 1973), they are not necessarily the only ideal values. Analysis was conducted to examine the sensitivity of the results to other possible ideal values.

For the third step in testing Hypothesis 4, I calculated a fit score by measuring the match between the ideal patterns and the patterns of the SBUs in the sample. Specifically, the degree of fit (or perhaps, more accurately, misfit) for any given SBU was measured as the euclidean distance between that SBU's scores and the scores of its ideal type, identified on the basis of the focal SBU's strategy. The resulting distance variable, therefore, represents a measure of the multivariate fit of each SBU with the relevant ideal profile and takes into account the overall effect of deviation on all the administrative mechanisms simultaneously.

Finally, the relationship between the deviation score and SBU effectiveness was assessed. A negative correlation between a distance score and SBU effectiveness indicated a good fit. The greater the distance from the respective ideal type, the lower the hypothesized performance. Table 4 shows the results of this analysis. As Hypothesis 4 predicts, SBU effectiveness is negatively correlated with an SBU's distance from its ideal profile. SBU effectivness correlated $-.23$ ($p < .01$) with overall distance (for all units). Table 4 also shows the component correlations between distance and performance within the low-cost and differentiation subgroups. SBUs practicing differentiation showed the greatest correlation between distance and effectiveness ($r = -.35, p < .01$), and the distance-effectiveness correlation was negative, as expected, but not significant, for SBUs practicing a strategy of low cost ($r = -.15$, n.s.). These results support Hypothesis 4, though the support is much stronger for SBUs employing a strategy of differentiation. I obtained findings very similar to those just reported when assessing the relationship between the distance measure and SBU effectiveness after controlling for the effects of company and SBU size.[2]

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[2] The results of this analysis are available from the author.

TABLE 4
Correlations of Distance Measure with SBU Effectiveness

SBUs	Correlations	N
All units	− .23**	101
Subgroups		
Low-cost	−.15	51
Differentiation	−.35**	50

** $p < .01$

The analysis reported so far treated the end points of the design variables as the ideal values. I decided to examine the sensitivity of the results to those ideal values. Significant support for the systems approach to fit was obtained[3] when overall distance was calculated from the ideal values in the range of −1.00 to −0.50 for the low-cost group and in the range of +1.00 to +0.50 for the differentiation group. Use of ideal values in the range of −0.50 to −0.00 for the low-cost group and in the range of +0.50 to +0.00 for the differentiation group did not yield support for the systems fit. Those results provide strong support for Hypothesis 4.

DISCUSSION

For the bivariate interactions, the findings can be summarized as follows: high managerial internal locus of control and low emphasis on meeting a budget are associated with high performance in SBUs employing a strategy of differentiation. I observed those results after controlling for the confounding effects of SBU and corporate size on performance. Bivariate results did not provide support for the interaction between SBU strategy, decentralization, and effectiveness.

The data provided support for the systems approach to fit. Results based on the systems analysis indicated that when budget evaluative style, decentralization, and locus of control were aligned appropriately to meet the requirements of SBU strategy, superior performance occurred. Further, this systems fit was quite strong among differentiation SBUs but not so strong among low-cost units.

A comparison of the results of the bivariate and systems approaches yielded several useful insights that could not have been tapped if I had placed sole reliance on either one of the approaches. First, the systems results indicate that all three administrative mechanisms of concern are critical in strategy implementation. Sole reliance on bivariate interaction might have led to the incorrect conclusion that the decentralization-strategy fit has no implications for performance. Second, the bivariate interaction did detect fit for two administrative mechanisms, thereby suggesting that budget evaluative style and locus of control are more salient predictors of performance than decentralization. Thus, corporate executives might focus first on matching budget evaluative style and locus of control to strategy. Such an insight would not have been available from a sole reliance on the systems approach. Finally, using the systems approach, I assigned equal weights to deviations on all the administrative mechanisms. Using the bivariate results might have suggested that deviations along budget evaluative style and locus of control be assigned higher weights. Thus, the bivariate and systems approaches could be used in a complementary manner in future research to develop more complex theories involving weighted prediction of the effects of deviation along different design variables on performance (Caroll & Chang, 1970).

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[3] The results of this examination are available from the author.

Results of this study provide additional insights on the findings of prior research. The results pertaining to locus of control provide a useful extension to Miller and colleagues' (1982) study by relating the fit between locus of control and business strategy to an outcome variable like performance. Although previous research (Chandler, 1962; Rumelt, 1974; Vancil, 1980) has attempted to explain the differences in the average levels of decentralization across firms in terms of differences in firms' corporate strategies, the systems results explain why the level of decentralization might also vary across SBUs *within the same firm*. Finally, results pertaining to budget evaluative style provide insights into understanding the conflicting findings of the studies of Hopwood (1972) and Otley (1978) on the relationship between budget emphasis and organizational performance. It is conceivable that the subunits studied by Hopwood might have followed a very different strategy from the strategy pursued by the subunits examined by Otley. That divergence could explain why a strong emphasis on budget was associated with dysfunctional consequences in the Hopwood study, whereas the reverse was true in the Otley study.

Implications for Practice

The results of this study have both practical and theoretical relevance. At the level of practice, they suggest to chief executive officers of multibusiness organizations that they ought not to adopt a standardized, uniform approach to managing their businesses; rather, they need to adopt a flexible approach, tailoring the approach to the strategy of individual business units. In particular, this study has practical applications in two critical areas: strategic human resource management and control-system design.

From the standpoint of strategic human resource management, this study has useful implications not only for those responsible for selection and development of general managers in diversified firms but also for the general managers themselves. For an employer, the general manager selected for a job should be one whose locus of control is appropriate for the SBU strategy employed. Likewise, general managers themselves, reviewing potential future work assignments, should attempt to select an SBU with a strategy that fits their own locus of control dimension. Each of those decisions would be made with the same goal in mind—to improve the overall level of SBU effectiveness.

This study can also help practitioners develop new approaches to the design of control systems. Recently, several authors (e.g., Hayes & Abernathy, 1980) have argued that the financial control systems used by U.S. corporations, which emphasize short-term profit measures embodied in profit budgets, might have led to the lack of international competitiveness on the part of U.S. firms. One implication is that financial controls such as budget-based evaluation systems need to be deemphasized if American executives are to be innovative and maintain global competitiveness. This research argues that U.S. corporations might not be overcontrolled but miscontrolled. For instance, meeting a budget might still be an appropriate goal for low-cost SBUs, but more flexible techniques might be needed to manage differentiation SBUs.

Implications for Theory and Future Research

From the perspective of theory development, this study adds to the stream of research in strategic management (Govindarajan, 1986b, 1988; Gupta & Govindarajan, 1984a) that has addressed strategy implementation issues at the business-unit level. This is the first empirical study that has examined the linkage between SBU strategies and the three administrative mechanisms (organizational structure, control system, and managers' locus of control), especially as it relates to the effectiveness of business units. Future research in this area could benefit by considering some of the limitations of the present study. The most significant of those was this study's focus on only a few variables pertaining to administrative mechanisms and strategy. The ultimate goal of this line of research should be to develop and test a theoretical model with multiple strategy variables, multiple design variables, and multiple outcome variables. Table 5 contains a comprehensive set of strategy, design, and outcome variables and identifies three key strategic issues at the SBU level: (1) SBU mission or goals (Govindarajan & Shank, 1986), (2) SBU competitive strategy, or how an SBU chooses to compete to achieve its goals (Porter, 1980; Shank & Govindarajan, 1988), and (3) degree of interrelationships with other SBUs (Porter, 1985). Table 5 also identifies several design variables for control systems, structure, and managers. Each of those variables represents a choice for an organization. Finally, Table 5 identifies outcomes for both SBUs and individuals. Developing and testing a comprehensive model of strategy implementation at the SBU level would undoubtedly place theoretical and methodological demands on researchers that are far greater than those that are present when the focus is on a single design variable, a single strategy dimension, and a single outcome measure. Some of these theoretical and methodological issues are outlined below as a guide to future research.

Theoretical issues. First, complex theories are needed to explain the position that, for an SBU to be successful, design choices should be internally consistent and also consistent with the SBU's strategic context. Though

TABLE 5
A Comprehensive Set of Strategy, Design, and Outcome Variables

Dimensions	Variables
SBU strategy	Mission: build, harvest
	Competitive strategy: low-cost, differentiation
	Degree of interrelationships
Control system	Budgeting
	Budget participation
	Budget revisions
	Budget goal difficulty
	Budget evaluative style
	Incentive compensation
	Performance criteria used to decide bonus
	Formula-based vs. discretionary bonus determination
	Mix of salary and bonus
	Frequency of bonus payment
	Form of bonus payment
	Bonus based on corporate vs. SBU performance
	Output vs. behavior control
Organizational structure	Complexity
	Formalization
	Decentralization
	Administrative intensity
Managers	Biographical background
	Age
	Formal education
	Functional background
	Industry familiarity
	Organizational familiarity
	Personality orientation
	Risk taking
	Tolerance for ambiguity
	Flexibility
	Locus of control
	Problem-solving style
Outcomes	SBU effectiveness
	Job satisfaction of SBU general manager

several reasons might be advanced to support that position, uncertainty—a central idea in the present study—has much potential for developing such an integrated theory. Arguments already exist linking the three dimensions of SBU strategy studied here to uncertainty: Gupta and Govindarajan (1984a) linked uncertainty and mission; Gupta (1987) considered competitive strategy; and Tushman and Nadler (1978) considered interrelationships. Similarly, arguments have been made for the relationship between the four structural variables (see Table 5) and uncertainty (Ford & Slocum, 1977), between several control systems components and uncertainty (budget participation, Govindarajan, 1986a; budget revisions, Sathe, 1978; budget evaluative style, Hirst, 1983; formula-based versus discretionary bonuses, Govindarajan &

Gupta, 1985; output versus behavior control, Eisenhardt, 1985) and between several managerial-characteristics variables and uncertainty (risk taking and tolerance for ambiguity, Gupta & Govindarajan, 1984a; locus of control, Spector, 1982). Those groups of studies might serve as a foundation on which to build a theory of fit between strategy and design variables, with uncertainty as the unifying concept. A truly integrative theory would have to explain two interrelated relationships: (1) the requirement to match the individual design variables to one another and (2) the need to match the set of design variables to strategy.

Second, although several design variables might indicate a desired match with strategy, it is possible that one or more of those variables may be so salient as to overshadow or dominate the other variables. There is both theoretical and practical merit in examining the presence of such dominance among design variables.

Third, future studies also need to take into account the notion of equifinality. Instead of assuming a deterministic relationship between strategy and administrative mechanisms—that there is a one best way to design administrative mechanisms to implement a given strategy—proponents of the equifinality approach argue that multiple design alternatives may exist for effectively implementing a given strategy. Adopting the equifinality approach, Galbraith (1973), for instance, proposed that under conditions of high uncertainty, managers have at their disposal multiple design solutions, such as creating self-contained tasks, slack resources, and lateral relations. According to Galbraith, either one or some combinations of those design alternatives would work equally effectively under conditions of high uncertainty. In the context of this study's concerns, further research is needed to examine how different managerial characteristics, elements of control systems, and elements of structure could be used as substitutes for one another to effectively implement any given strategy.

Fourth, although the arguments in favor of matching administrative mechanisms to strategies might be compelling, there could be circumstances in which a deliberate mismatch between those two variables could lead to favorable outcomes. For example a corporate policy of high lateral transfers as a management development tool would work against the notion of matching managers to strategies (cf. Gupta, 1987). Examining the conditions under which the benefits of misfit might outweigh its costs would certainly enhance the contingency theory of strategy implementation at the SBU level.

Fifth, future research needs to capture the dynamic interaction between strategy and administrative mechanisms. Over time, an SBU's strategy will change, which can result in a mismatch between administrative systems and strategy. Will a strong fit between administrative systems and a current strategy hinder strategic changes, even when they are required? How can firms develop optimum administrative systems that will minimize the transitional trauma an SBU must undergo when changing strategies? Future investigations might consider those interrelated issues.

Finally, in addition to examining the impact of the fit between strategy and design variables on an organizational outcome like effectiveness, there is merit in incorporating individual outcomes in such models. Future research could focus on the implications of such a fit for managerial job satisfaction.

Methodological issues. First, the present study relied exclusively on self-report measures. Although I believe that the results of the validity and reliability tests carried out and reported in this study argue for sufficient confidence in those measures, future investigations using objective data would undoubtedly yield more powerful results.

Second, although all hypotheses were stated in associational terms, the logic behind them implies that interaction between strategy and administrative mechanisms is not just associated with, but causes, greater effectiveness. Because the data in this study are cross-sectional and snapshot-like, tests for such causality were not possible. Nonetheless, on an a priori basis, the results of this study are promising for the fruitfulness of longitudinal studies undertaken specifically to examine causal linkages. Such a longitudinal research design would also help researchers to examine the possibility that the effect of an improper fit between administrative mechanisms and strategy, especially a recently developed mismatch, might not be fully reflected in a current period's performance but might affect performance after a couple of periods.

Finally, future researchers need to undertake both bivariate and systems analyses since, as Drazin and Van de Ven (1985) argued and this study demonstrated, joint use of both analyses yields more insightful results. Further methodological work is needed to modify and extend Van de Ven and Drazin's (1985) systems analysis to accommodate (1) the ability to test the internal consistency among design variables, in addition to testing their consistency with strategy, and (2) the ability to detect equifinality among design variables.

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APPENDIX

SBU effectiveness. Effectiveness data were collected on ten performance dimensions: return on investment, profit, cash flow from operations, cost control, development of new products, sales volume, market share, market development, personnel development, and political-public affairs. On each of the dimensions, SBU general managers were asked to rate, on a 7-point Likert scale ranging from "significantly below average" to "significantly above average," the SBU's performance relative to corporate standards. Next, each respondent was asked to rate each of the ten performance dimensions on a 5-point Likert scale ranging from "not important" to "extremely important" and indicate the degree of importance superiors attached to SBU performance on these criteria. With the data on dimensional importance as weights, a weighted average performance index was obtained for each SBU.

Porter's competitive strategy. SBU general managers were asked to position their products *relative to those of leading competitors* in the following six areas: product selling price, percent of sales spent on research and development, percent of sales spent on marketing expenses, product quality, brand image, and product features. A 7-point Likert scale was used with values ranging from "significantly lower" to "significantly higher." The scores for the six items were summed for a combined scale. The response set was polarized so that high values on this variable indicated a strong differentiation strategy and low values indicated a strong low-cost strategy.

Budget evaluative style. SBU general managers were asked the following question from Hopwood (1972):

What do you think are the *three factors* that count the most in how your superior evaluates your performance? Put the numbers 1,2, and 3 next to items that count the most, the second most, and the third most, respectively. How much effort I put into my job. My concern with profits. My concern with quality. How well I meet the budget. My ability to handle my subordinates. How efficiently I run my business unit. My attitude toward my work. How well I get along with my superiors.

A continuum of evaluative style (Otley, 1978) was constructed using the following scheme: 5 = neither meeting the budget (B) nor running the unit efficiently (E) ranked among the top three criteria; 4 = E but not B ranked among the top three criteria; 3 = both E and B ranked among top three criteria, but E higher than B; 2 = both E and B ranked among top three criteria, but B higher than E; and 1 = B but not E ranked among the top three criteria. Low values on this variable indicated great importance attached to meeting a budget in evaluating an SBU manager's performance.

Locus of control. SBU general managers were asked to indicate which they more strongly believed to be the case for each of the items presented below (from Rotter, 1966):

1. Many of the unhappy things in people's lives are partly due to bad luck. People's misfortunes result from the mistakes they make.
2. Without the right breaks one cannot be an effective leader. Capable people who fail to become leaders have not taken advantage of their opportunities.
3. I have often found that what is going to happen will happen. Trusting to fate has never turned out as well for me as making a decision to take a definite course of action.
4. Becoming a success is a matter of hard work, luck has little or nothing to do with it. Getting a good job depends mainly on being in the right place at the right time.
5. When I make plans, I am almost certain that I can make them work. It is not always wise to plan too far ahead because many things turn out to be a matter of good or bad fortune anyhow.
6. In my case, getting what I want has little or nothing to do with luck. Many times we might just as well decide what to do by flipping a coin.
7. Who gets to be the boss often depends on who was lucky enough to be in the right place first. Getting people to do the right thing depends upon ability; luck has little or nothing to do with it.
8. Most people can't realize the extent to which their lives are controlled by accidental happenings. There really is no such thing as "luck."
9. In the long run the bad things that happen to us are balanced by the good ones. Most misfortunes are the result of lack of ability, ignorance, laziness or all three.
10. Many times I feel that I have little influence over things that happen to me. It is impossible for me to believe that chance or luck plays an important role in my life.
11. What happens to me is my own doing. Sometimes I feel that I don't have enough control over the direction my life is taking.

Decentralization. SBU general managers were provided with the following list of operating decisions (Vancil, 1980) that could affect SBU performance: (1) increasing (beyond budget) the level of expenditure for advertising and promotion; (2) changing the selling price on a major product or product line; (3) increasing (beyond budget) the level of expenditure for research and development; (4) increasing (beyond budget) the number of employees in a business unit.

Using an approach similar to Hofstede's (1967), I provided SBU general managers with the following 7-point Likert scale to indicate the *typical* influence they had in affecting the outcome of each decision: decision taken by you without consulting your superior; proposal by you, followed by consultation with superior, with your opinion prevailing; proposal by you, decision made *jointly* by you and your superior; proposal by superior, your opinion is asked and it carries a *lot* of weight; proposal by superior, your opinion is asked and it carries *little* weight; your opinion is not asked but decision is explained to you; your opinion is not asked, decision is not explained to you. Responses on the four questions were summed to create an index of decentralization for each respondent.

Size. Company size was measured in terms of the firm's total sales, information obtained from the annual report of each company. SBU size was measured in terms of number of full-time employees, information secured from the SBU general managers through the questionnaire. Both size variables were computed as the logarithm of their respective figures. The effect of the logarithmic adjustment was to dilute the extreme variability in size and achieve a more normal distribution.

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CORPORATE SOCIAL RESPONSIBILITY AND FIRM FINANCIAL PERFORMANCE

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Using *Fortune* magazine's ratings of corporate reputations, we analyzed the relationships between perceptions of firms' corporate social responsibility and measures of their financial performance. Results show that a firm's prior performance, assessed by both stock-market returns and accounting-based measures, is more closely related to corporate social responsibility than is subsequent performance. Results also show that measures of risk are more closely associated with social responsibility than previous studies have suggested.

The management literature has acknowledged social responsibility as an important corporate duty (Quinn, Mintzberg, & James, 1987). Given the significance of corporate social responsibility in corporate decision making, the relationship between a firm's social and ethical policies or actions and its financial performance (Arlow & Gannon, 1982; Ullmann, 1985) is an important topic.

Various arguments have been made regarding the relationship between firms' social responsibility and their financial performance. One view is that firms face a trade-off between social responsibility and financial performance. Those holding this view propose that firms incur costs from socially responsible actions that put them at an economic disadvantage compared to other, less responsible, firms (Aupperle, Carroll, & Hatfield, 1985; Ullmann, 1985; Vance, 1975). A second, contrasting viewpoint is that the explicit costs of corporate social responsibility are minimal and that firms may actually benefit from socially responsible actions in terms of employee morale and productivity (Moskowitz, 1972; Parket & Eibert, 1975; Soloman & Hansen, 1985). A third perspective is that the costs of socially responsible actions are significant but are offset by a reduction in other firm costs. For instance, stakeholder theory (Cornell & Shapiro, 1987) suggests that a firm must satisfy not only stockholders and bondholders, but also those with less explicit, or implicit, claims. Stakeholder theory further suggests that implicit claims like

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product quality are less costly to a firm than explicit claims like wage contracts or stockholder or bondholder demands. Low social responsibility, however, may encourage some stakeholders to doubt the ability of a firm to honor implicit claims and may increase the number of a firm's more costly explicit claims.

In addition, Alexander and Bucholtz (1978) and Bowman and Haire (1975) have suggested that stakeholders and stock- and bondholders may see corporate social responsibility as indicating management skill. In short, a firm has an investment in reputation, including its reputation for being socially responsible. An increase in perceived social responsibility may improve the image of the firm's management and permit it to exchange costly explicit claims for less costly implicit charges. In contrast, a decline in the level of stakeholders' view of a firm's social responsibility may reduce its reputation and result in an increase in costly explicit claims.

In this study, we used data from the *Fortune* survey of corporate reputations to examine two aspects of the relationship between corporate social responsibility and firm financial performance that previous research has ignored. First, we not only measured performance in terms of accounting- and stock-market-based measures but also in terms of risk. Second, we examined not only the extent to which social responsibility predicted financial performance but also whether prior financial performance predicted social responsibility. This study also improved on the the methodology used in previous studies by using evaluations of social responsibility made by knowledgeable external sources.

THEORETICAL FRAMEWORK

Research into the relationship between corporate social responsibility and financial performance has been based on several theoretical arguments. Those who have suggested a negative relation between social responsibility and financial performance have argued that high responsibility results in additional costs that put a firm at an economic disadvantage compared to other, less socially responsible firms (Bragdon & Marlin, 1985; Vance, 1975). These added costs may result from actions like making extensive charitable contributions, promoting community development plans, maintaining plants in economically depressed locations, and establishing environmental protection procedures. In addition, concern for social responsibility may limit a firm's strategic alternatives. For example, a firm may forgo certain product lines, such as weapons or pesticides, and avoid plant relocations and investment opportunities in certain locations (e.g., South Africa).

In contrast, other scholars investigating corporate social responsibility and performance have argued for a positive association. Several authors have cited improved employee and customer goodwill as an important outcome of social responsibility (Davis, 1975; Soloman & Hansen, 1985). For example, a firm perceived as high in social responsibility may face relatively few labor problems, and customers may be favorably disposed to its products. Socially responsible activities may also improve a firm's standing with such important constituencies as bankers, investors, and government officials. Improved relationships with these constituencies may bring economic benefits (Moussavi & Evans, 1986). Indeed, banks and other institutional investors have reported social considerations to be a factor in their investment decisions (Spicer, 1978). High corporate social responsibility may therefore improve a firm's access to sources of capital.

Lastly, modern corporate stakeholder theory (Cornell & Shapiro, 1987) contends that the value of a firm depends on the cost not only of explicit claims but also of implicit claims. From this viewpoint, the set of claimants on a firm's resources goes beyond the stockholders and bondholders to include stakeholders who have explicit claims on the firm like wage contracts and others with whom the firm has made implicit contracts, involving, for instance, quality service and social responsibility. If a firm does not act in a socially responsible manner, parties to implicit contracts concerning the social responsibility of the firm may attempt to transform those implicit agreements into explicit agreements that will be more costly to it. For example, if a firm fails to meet promises to government officials in regard to actions that affect the environment (dumping, etc.), government agencies may find it necessary to pass more stringent regulations, constituting explicit contracts, to force the firm to act in a socially responsible manner. Moreover, socially, irresponsible actions may spill over to other implicit stakeholders, who may doubt whether the firm would honor their claims. Thus, firms with an image of high corporate social responsibility may find that they have more low-cost implicit claims than other firms and thus have higher financial performance (Cornell & Shapiro, 1987).

Although theory and research have focused primarily on the relationship between corporate social responsibility and measures of financial performance, an argument for a relationship between social responsibility and such measures of financial risk as variance in earnings and in stock returns can also be made (Spicer, 1978; Ullmann, 1985). First, low levels of social responsibility may increase a firm's financial risk. Investors may consider less socially responsible firms to be riskier investments because they see management skills at the firm as low (Alexander & Bucholtz, 1978; Spicer, 1978). Investors and other constituencies may also anticipate an increase in firm costs owing to lack of social responsibility. For example, the government may levy fines, and law suits, such as those recently filed against pharmaceutical, chemical, and asbestos firms, that may threaten a firm's very existence. Perceptions of low social responsibility may also decrease a firm's ability to obtain capital at consistent rates.

In contrast, a high degree of corporate social responsibility may permit a firm to have relatively low financial risk as the result of more stable relations with the government and the financial community. In addition, to the degree that a firm has high social responsibility, it may also have a low percentage of total debt to total assets. A low total debt ensures that a firm can easily continue to satisfy implicit claims. Thus, compared to other firms, firms with high social responsibility may have lower market- and accounting-based total risk because they are less sensitive to certain external events, like governmental actions, and have a lower debt. The impact of social responsibility on measures of a firm's systematic risk may, however, be minimal, since most events affecting a firm's level of social responsibility do not systematically affect all other firms in the marketplace (Cornell & Shapiro, 1987).

Most studies have related social responsibility and concurrent financial performance. We also explored the effects of prior and subsequent performance on subsequent and prior evaluations of corporate social responsibility. The theoretical arguments suggested regarding the concurrent relationship between corporate social responsibility and financial performance also apply to the relationship with subsequent financial performance. The benefits of social responsibility cited earlier (e.g., employee motivation, customer goodwill) may carry over into later periods. To the degree that a firm with relatively high social responsibility can implement implicit contracts, its financial performance may improve and variability in market- and accounting-based performance measures may decline.

Corporate social responsibility may also be linked to past firm performance. Its financial performance may influence a firm's evolving social policy and actions (Ullmann, 1985). Policies and expenditures, particularly in discretionary areas such as social programs, may be especially sensitive to the existence of slack resources (Cyert & March, 1963). If corporate social responsibility is viewed as a significant cost, firms with relatively high past financial performance may be more willing to absorb these costs in the future (Parket & Eibert, 1975; Ullmann, 1985). In contrast, less profitable firms may be less willing to undertake socially responsible actions.

PREVIOUS RESEARCH

Previous research has yielded mixed results regarding the relationships between corporate social responsibility and measures of firm performance. Reviews by Aupperle and colleagues (1985), Cochran and Wood (1984), and Ullmann (1985) have all found mixed results concerning the concurrent relationship between social responsibility and firm performance. Ullmann suggested that those conflicting results may derive, in part, from differences in research methodologies and measures of financial performance.

Studies using stock-market-based measures of return have reported mixed results regarding the relationship between social responsibility and performance. Moskowitz (1972) ranked 67 selected firms in terms of his evaluation of their level of social responsibility and reported higher than average stock returns for highly ranked firms. Vance (1975), however, found a subset of the firms rated by Moskowitz had lower stock-market performance than a comparison sample of firms listed in the New York Stock Exchange Composite Index, Dow Jones Industrials, and Standard and Poor's Industrials. The studies by Vance and Moskowitz, however, both failed to adjust for risk. Other studies that have attempted to adjust stock-return performance measures for risk have found little relationship between social responsibility and market performance. Alexander and Bucholtz (1978), using the firms listed in Moskowitz's study, found little association between social responsibility and risk-adjusted return on securities.[1]

Studies examining the relationship between social responsibility and accounting-based performance measures have generally found positive results. Bragdon and Marlin (1972), Bowman and Haire (1975), and Parket and Eibert (1975) found generally positive associations between corporate social responsibility and accounting-based measures of performance. However, those studies did not control for the possible effects of other variables. Later studies that have attempted to control for differences in risk have offered more cautious support for the relationship between social responsibility and accounting-based performance measures. Cochran and Wood (1984) found a positive correlation between social responsibility and accounting performance after controlling for the age of assets. In contrast, Aupperle and colleagues (1985) found no significant relationships between social responsibility and a firm's ROA adjusted by its ranking in the Value Line Safety Index. Since financial risk and performance vary with industry, Sturdivant and Ginter (1977) compared accounting-based measures of performance for a subsample of the firms rated by Moskowitz to industry averages. They categorized firms as best, honorably mentioned, and worst in terms of social responsibility. Firms given an honorable mention had higher accounting-based performance than the other firms.

Previous studies on the relationship between social responsibility and risk have also produced mixed results. Spicer (1978) found that firms rated high on social performance, as measured by pollution control activities, had lower total and systematic risk than less socially responsible firms. Aupperle and colleagues also (1985) found a negative association between corporate social responsibility and accounting-based risk but found that the association between market-based risk and social responsibility was insignificant.

Previous studies have also employed varying measures of corporate social responsibility. Three methods have commonly been used. The first uses expert evaluations of corporate policies. The validity of this methodology, of course, depends on the skill and qualifications of those making the assessments (Abbott & Monsen, 1979). Previous studies have used an index from the Council of Concerned Businessmen (Sturdivant & Ginter, 1977) and two rankings from *Business and Society* (Moskowitz, 1972, 1975). The validity of these indexes is subject to criticism. Moskowitz's ratings were based on his own evaluation. In the case of the ratings published in 1975, done on samples of businessmen and M.B.A. students, the expertise of the evaluators and the accuracy of the information are questionable (Bowman & Haire, 1975).

Other researchers have used content analysis of corporate annual reports or other corporate documents (Abbot & Monsen, 1979; Anderson & Frankel,

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[1] Adjusting for beta adjusts for systematic or general market risk. Lubatkin and Shrieves (1986) and Aaker and Jacobson (1987) discuss the adjustment of market-based performance measures for risk.

1980; Bowman & Haire, 1975; Preston, 1978). Such measures, however, confuse social orientation with corporate actions (Arlow & Gannon, 1982; Ullmann, 1985). Moreover, such documents often have more public relations value than informational value. The relationship between such public statements and actual corporate actions is uncertain. Bowman and Haire found a positive association between emphasis on corporate social responsibility in annual reports and the Moskowitz ratings. Preston, however, found no relation between these variables. Parket and Eibert (1975) used a corporation's willingness to respond to a questionnaire on social responsibility as an indicator of the firm's concern with the issue.

The third method of measuring corporate social responsibility uses performance in controlling pollution as a proxy measure. The Council of Concerned Businessmen Pollution Performance Index is frequently used (Bragdon & Marlin, 1972; Folger & Nutt, 1975; Spicer, 1978). Pollution control, however, reflects only one aspect of social responsibility and is only valid for certain industries (Bragdon & Marlin, 1972).

The types of measures previous studies have used influence results because accounting- and stock-market-based performance measures focus on different aspects of performance, and each is subject to particular biases (McGuire, Schneeweis, & Hill, 1986). Accounting-based measures tap only historical aspects of firm performance (McGuire, Schneeweis, & Hill, 1986). Moreover, they are subject to bias from managerial manipulation and differences in accounting procedures (Branch, 1983; Brilloff, 1972, 1976). Accounting performance should also be adjusted for risk, industry characteristics, and other variables (Aaker & Jacobson, 1987; Arlow & Gannon, 1982; Davidson, Worrell, & Gilberton, 1986; Michel & Shaked, 1984; Ullmann, 1985).

To avoid the problems of accounting-based measures, some authors have used stock-market-based measures of performance. Market returns have several advantages over accounting-based measures: they are (1) less susceptible to differential accounting procedures and managerial manipulation and (2) represent investors' evaluations of a firm's ability to generate future economic earnings rather than past performance.

Problems also exist, however, with the use of stock-market-based measures of performance (McGuire, Schneeweis, & Branch, 1986). Ullmann (1985) suggested that the use of market measures implies that investors' valuation of firm performance is a proper performance measure. Since firms face multiple constituencies (Pfeffer & Salancik, 1978), sole concentration on investors' evaluations may not be sufficient.

Given the debate over the proper measure of financial performance, in this study we used both accounting- and stock-market-based measures to investigate the relationships between concurrently, previously, and subsequently measured firm performance and corporate social responsibility. We also improved upon the methodology used in previous studies by using evaluations of corporate social responsibility from knowledgeable external sources.

METHODS

Data

Data on corporate social responsibility were obtained from *Fortune* magazine's annual survey of corporate reputations. *Fortune* has conducted the survey each fall since 1982 and published summary results each January. The survey covers the largest firms in 20–25 industry groups (the number of industry groups varies from year to year). Over 8,000 executives, outside directors, and corporate analysts are asked to rate the ten largest companies in their industry on eight attributes: financial soundness, long-term investment value, use of corporate assets, quality of management, innovativeness, quality of products or services, use of corporate talent, and community and environmental responsibility. Ratings are on a scale of 0 (poor) to 10 (excellent). The response rate of those surveyed has averaged almost 50 percent for each year of the survey (*Fortune*, 1983, 1986). Chakravarthy (1986) and Wartick (1987) have also used this data set.

The *Fortune* magazine survey was chosen for several reasons. First, it provides comparable data over an extended period. Second, the number of respondents is comparable or superior to those of other ratings. Third, respondents rate only firms in an industry with which they are familiar. They have direct access to internal firm and industry information that is particularly critical in the area of corporate social responsibility, where annual reports and other official documents provide incomplete and inconsistent information (Bowman & Haire, 1979).[2]

Evidence for the validity of the evaluations comes from empirical studies using other dimensions of the *Fortune* survey (Chakravarthy, 1986; McGuire, Schneeweis, & Branch, 1987). Those studies have found that the *Fortune* evaluations of firms' financial performance are highly correlated with accounting- and stock-market-based performance measures. Major changes in a firm's ranking often correspond to specific events, such as product changes or lawsuits, or to changes in performance (*Fortune*, 1986). The *Fortune* ratings differ from those of other evaluators of social responsibility in that the respondents are selected for their knowledge of a particular industry rather than for their specific knowledge of or interest in corporate social responsibility. Thus, their interpretation and evaluation of social responsibility may differ from those of others who are specifically interested in the issue. Wartick (1987), however, found the *Fortune* ratings to be associated with membership in the Issues Management Association, which suggests that the ratings do indicate an orientation toward corporate social responsibility.[3]

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[2] Industry analysts follow firms in a particular industry and advise investment houses and other institutional investors. Their livelihood, and that of their employers and investors, depends on their knowledge of firms in an industry. Since corporate social responsibility is one consideration in analysts' investment decisions (Spicer, 1978), they would be knowledgeable in this aspect of firm performance.

To evaluate the reliability of the ratings, we checked for consistency between the 1985 and 1986 evaluations. Although some modification of the ratings could be expected because of changing conditions and firm actions, major modifications would suggest lack of reliability. It should also be noted that the respondents *Fortune* uses change slightly each year. The correlation between the two sets of evaluations was .899.

Measures of Financial Performance

Data on accounting- and stock-market-based measures of firm performance and risk were obtained from the COMPUSTAT data base. The Appendix defines the measures of firm performance and risk we used. Market performance was measured by risk-adjusted return, or alpha, and total return. Market risk measures were beta, a measure of systematic risk, and the standard deviation of total return. Accounting-based performance measures were return on assets (ROA), total assets, sales growth, asset growth, and operating income growth. The ratio of debt to assets, operating leverage, and the standard deviation of operating income were our accounting-based measures of risk.

Periods of Analysis

Two sets of ratings of corporate social responsibility were used in this analysis. First, we computed average rankings for the period 1983–85, including the 98 firms and industries that appeared in all the yearly surveys and for which financial performance data were available. Second, to permit analysis of the relationship between corporate social responsibility and previous and subsequent firm financial performance, we used ratings of social responsibility for one year, 1983. *Fortune* produced these ratings in late 1982 and published them in January 1983. All the 131 firms rated by *Fortune* and for which financial performance data were available were included in this analysis.[4]

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[3] To further validate the ratings, we compared the *Fortune* ratings to a rating of corporate social responsibility produced by the Council on Economic Priorities (1987). The council evaluated consumer products firms on charitable contributions, representation of women and minorities on their boards of directors and in executive positions, social disclosure, South Africa involvement, and nuclear and nonnuclear arms production. Ratings of the 58 firms by both sources were compared by summing the number of "positive" or "socially responsible" evaluations given by the Council of Economic Priorities. The correlation between the two sets of evaluations was .47. Although the correlation is not as strong as would have been hoped, it is of interest. The Council of Economic Priorities ratings covered only consumer products, thus excluding many of the industries surveyed by *Fortune*. Moreover, differing definitions of corporate social responsibility likely influenced the correlation. For example, the council considered holding contracts for arms production to indicate lack of corporate social responsibility and it is unlikely that the *Fortune* evaluators did so.

[4] The mean social responsibility rating for the 1983 survey was 6.01, with a standard deviation of .774. The mean 1983–85 rating was 6.31, with a standard deviation of .688. The means and standard deviations of the other variables are available from the authors.

TABLE 1
Correlations Among 1977–81 Financial Variables[a]

Variables	1	2	3	4	5	6	7	8	9	10	11	12
1. 1983 corporate social responsibility												
2. ROA	.51**											
3. Average assets	.15	−.05										
4. Operating income growth	.04	.16*	−.15									
5. Sales growth	.15	.17*	−.02	.81**								
6. Asset growth	.35**	.22*	.22*	−.15	−.02							
7. Alpha	.17*	−.17*	−.17*	.62**	.49**	.42**						
8. Total return	.08	.23**	−.23**	.66**	.53**	.46**	.96**					
9. Debt to assets	−.49**	−.68**	.20*	.05	.09	.01	.01	.05				
10. Operating leverage	.23**	.25**	.07	.24**	.12	.08	.21*	.17*	.11			
11. Standard deviation of operating income	.16*	.09	.84**	−.20*	−.02	.03	−.16*	−.20*	.05	.02		
12. Beta	−.32**	−.12	−.27**	.21*	.27**	.23**	.10	.35**	.15	.09	−.16*	
13. Standard deviation of total return	−.44**	−.29**	−.27**	.18*	.15	−.14	.01	.24**	.28**	−.12	−.18*	.89**

[a] $N = 131$

* $p < .05$

** $p < .01$

TABLE 2
Correlations Among 1982–84 Financial Variables[a]

Variables	1	2	3	4	5	6	7	8	9	10	11	12
1. 1983 corporate social responsibility												
2. ROA	.41**											
3. Average assets	.15	.01										
4. Operating income growth	−.03	.02	.11									
5. Sales growth	.02	.16*	.10	−.68**								
6. Asset growth	.03	.11	.15	.43**	.71**							
7. Alpha	−.07	.28**	.12	.11	.42**	.14						
8. Total return	−.15	.22**	.16*	.51**	.54**	.38**	.93**					
9. Debt to assets	−.44**	−.47**	.32**	.15	.13	.14	.17*	.25**				
10. Operating leverage	−.06	−.03	.16*	−.08	−.08	−.04	−.04	−.06	.11			
11. Standard deviation of operating income	.09	.18*	.74**	.32**	.21*	.12	.22*	.24**	.13	.08		
12. Beta	−.32**	−.27**	.08	.11	.10	.13	−.53**	−.18*	.13	−.05	−.03	
13. Standard deviation of total return	−.44**	−.37**	.14	.09	−.05	−.14	−.45**	−.19*	.32**	.00	.32**	.77**

[a] $N = 131$

* $p < .05$

** $p < .01$

Financial performance variables were averaged over two periods: 1982–84 and 1977–81. Tables 1 and 2 show correlations among the financial variables for the periods studied. The financial performance variables for 1982–84 are contemporaneous with the 1983–85 social responsibility ratings and subsequent to the 1983 ratings. Thus, by comparing the 1982–84 financial performance ratings to the average *Fortune* rating for 1983–85, we could examine the concurrent relationship between corporate social responsibility and financial performance. Analysis of 1983 ratings in relation to the 1977–81 and 1982–84 financial performance variables permitted us to evaluate the relation between prior financial performance and corporate social responsibility using the 1977–81 measures and to evaluate subsequent financial performance using the 1982–84 data.

RESULTS

Correlational Analysis

Concurrent performance. Table 3 presents the correlations between contemperaneous evaluations of corporate social performance (1983–85) and accounting- and market-based performance measures (1982–84). Correlations between social responsibility and stock-market-based measures of performance are insignificant (.04 and −.07), suggesting that there is little contemporaneous association. Three of the accounting-based measures of performance, however, are significantly correlated with corporate social responsi-

TABLE 3
Correlations Between Corporate Social Responsibility and Firm Performance[a]

Performance Dimensions	1983–85 Social Responsibility and 1982–84 Performance	1983 Social Responsibility and 1977–81 Performance	1983 Social Responsibility and 1982–84 Performance
ROA	.47**	.52**	.41**
Total assets	.20	.15	.15
Operating income growth	−.21	.04	−.03
Sales growth	.04	.15	.02
Asset growth	.03	.35**	.03
Alpha	.04	.17*	−.07
Total return	−.07	.08	−.15
Debt/assets	−.49**	−.49**	−.44**
Operating leverage	−.05	.23**	−.06
Standard deviation of operating income	.11	.15	.09
Beta	−.27*	−.32**	−.32**
Standard deviation of total return	−.45**	−.44**	−.44**

[a] N = 98, 131, and 131 for columns 1, 2, and 3, respectively.
* $p < .05$
** $p < .01$

bility. ROA and total assets show positive relationships (.47 and .20, respectively), and operating income growth has a negative correlation (−.21). The positive association between ROA, an accounting-based measure of contemporaneous performance, and corporate social responsibility supports the view that, through its effects on stakeholders, social responsibility affects financial performance (Cornell & Shapiro, 1987). The negative association with operating income growth might be due to the high social responsibility ratings of several mature firms such as IBM (*Fortune*, 1983, 1986) that may tend to have more stable earnings than other firms. The other accounting measures have little association with corporate social responsibility.

The accounting- and stock-market-based risk measures tend to be negatively associated with social responsibility. Both beta and the standard deviation of total return show negative correlations (−.27 and −.45, respectively). One accounting-based risk measure, the ratio of debt to assets, has a significant negative association with corporate social responsibility. These results are also consistent with the view (Cornell & Shapiro, 1987) that firms with many implicit contracts with stakeholders may have lower debt than other firms.

Pre- and post-survey analysis. Analysis of the concurrently measured relationship between social responsibility and financial performance does not address the question of whether prior high financial performance allows a firm to engage in future socially responsible activities or if significant associations between current social responsibility and performance are artifacts of previous high performance. Table 3 presents results of the correlation analysis between prior firm financial performance and corporate social responsibility. The level of correlation for two measures of market return, total return and alpha, provides little support for the relationship between prior stock-market performance and subsequent social responsibility: the correlations are positive but significant only for alpha. Of the accounting-based performance measures, ROA, sales growth, and asset growth are associated with high perceived social responsibility (.52, .15, and .35), but correlations for the other accounting performance measures are insignificant. Corporate social responsibility is negatively associated with risk as measured by the ratio of debt to assets (−.49), beta (−.32), and the standard deviation of total return (−.44) and positively associated with operating leverage. These results suggest that low-risk firms and firms with a high return on assets will later have an image of high social responsibility.

Table 3 also shows the correlations between corporate social responsibility and performance measured at a later time. ROA is again highly correlated with social responsibility; measures of stock-market performance, however, show little association with it. However, both stock-market and accounting-based risk measures are negatively correlated with previous social responsibility (debt to assets −.44, beta, −.32; standard deviation of total return, −.44).

Regression Analysis

To test the multivariate relationship between corporate social responsibility and firm performance, we also conducted regression analyses. Since measures of financial performance tend to be correlated (McGuire, Schneeweis, & Branch, 1986), care must be taken in interpreting individual regression coefficients. Table 4 presents the results of stepwise regression analyses using perceived corporate social responsibility in 1983 as the independent variable.

TABLE 4
Results of Regression Analysis Predicting 1983 Corporate Social Responsibility

Variables	Beta	F	Multiple R	R^2	Adjusted R^2	F
Prior accounting performance						
ROA	.669	44.07	.514	.265		
Average assets	.141	3.55	.543	.269		
Sales growth	.641	3.71	.548	.301		
Operating income growth	–.364	2.92	.563	.317		
Variables as a set					.294	13.73**
Prior market performance						
Alpha	1.121	19.28	.168	.028		
Total return	–.963	16.11	.378	.143		
Variables as a set					.129	10.04**
Prior accounting risk						
Debt/assets	.279	39.18	.493	.242		
Standard deviation of operating income	.357	5.46	.526	.276		
Operating leverage	.398	4.68	.551	.304		
Variables as a set					.287	17.34*
Prior market risk						
Standard deviation of total return	–.235	16.50	.437	.191		
Beta	.537	2.92	.459	.211		
Variables as a set					.211	16.02**
Subsequent accounting performance						
ROA	.590	24.59	.413	.171		
Average assets	.973	3.31	.437	.191		
Sales growth	–.148	0.12	.441	.195		
Operating income growth	–.496	0.63	.442	.195		
Variables as a set					.195	7.16**
Subsequent market performance						
Total return	–.346	5.85	.146	.021		
Alpha	.241	3.80	.227	.052		
Variables as a set					.052	3.26*
Subsequent accounting risk						
Debt/assets	–.253	30.37	.437	.191		
Standard deviation of operating income	.281	3.36	.461	.212		

TABLE 4 (continued)

Variables	Beta	F	Multiple R	R^2	Adjusted R^2	F
Operating leverage	.494	0.49	.462	.213		
Variables as a set					.193	16.75**
Subsequent market risk						
Standard deviation of total return	−.211	22.46	.361	.131		
Beta	.572	6.46	.148	.175		
Variables as a set					.287	17.34**
Prior accounting risk/return						
ROA	.317	4.66	.514	.265		
Debt/assets	−.215	11.17	.549	.301		
Average assets	.368	6.96	.594	.353		
Sales growth	.717	3.21	.613	.376		
Operating leverage	.288	2.34	.620	.384		
Operating income growth	−.342	2.26	.626	.392		
Standard deviation of operating income	−.419	2.04	.634	.402		
Asset growth	.869	0.71	.635	.403		
Variables as a set					.361	9.61**
Prior market risk/return						
Standard deviation of total return	−.217	13.85	.438	.192		
Total return	.117	3.40	.475	.226		
Beta	.347	1.11	.482	.232		
Variables as a set					.233	12.03**
Subsequent accounting risk/return						
Debt/assets	−.259	23.40	.437	.191		
Average assets	.323	16.43	.535	.286		
ROA	.327	6.37	.564	.318		
Standard deviation of operating income	−.519	4.88	.585	.342		
Operating income growth	.796	0.17	.588	.346		
Operating leverage	−.583	0.48	.591	.349		
Sales growth	.951	0.57	.591	.349		
Variables as a set					.309	8.82*
Subsequent market risk/return						
Standard deviation of return	−.220	25.43	.361	.131		
Alpha	−.125	6.62	.448	.201		
Beta	.380	2.69	.457	.219		
Variables as a set					.199	11.09**

* $p < .05$
** $p < .01$

Prior stock-market and accounting-based performance measures were used separately to predict social responsibility. Accounting-based performance had a higher explanatory value than stock-market performance (R^2 = .294 and .129, respectively.) Accounting risk variables also appeared to produce a better explanatory model than stock-market risk variables (R^2 = .287

and .211, respectively). One possible reason for these results is that two market-based measures, total return and beta, are related primarily to systematic movements among all firms. In contrast, accounting measures are more likely to capture unique, or unsystematic, firm attributes. Since actions leading to high or low perceived corporate social responsibility may be predominately unsystematic, accounting performance may better capture social responsibility.

Subsequently measured accounting-based performance appeared to be a better predictor of social responsibility than subsequent stock-market performance (R^2 = .195 and .052, respectively). In contrast, subsequent stock-market risk produced a better explanatory model than subsequent accounting risk (R^2 = .193 and .287).

A comparison of equations using performance measured before and after 1983 thus suggests that perceptions of social responsibility are more closely associated with prior financial performance than with subsequent financial performance. With only one exception, prior performance and risk were better predictors than were subsequent performance and risk. The results of regression equations in which both market- and accounting-based risk and return are used to explain social responsibility offer further support. In all cases, the equations using prior accounting- and stock-market-based measures of risk and return had a higher predictive value than those using subsequent measures.

DISCUSSION

The correlation and regression results presented in this study suggest several conclusions. First, although performance tended to predict corporate social responsibility better than risk, measures of risk also explained a significant portion of the variability in social responsibility across firms. We noted earlier that theoretical arguments can be made for a relationship between social responsibility and firm risk. Lack of social responsibility may expose a firm to significant additional risk from lawsuits and fines and may limit its strategic options. Rather than looking for increased profitability from socially responsible actions, managers and those interested in the financial impact of social responsibility might look toward reduced risk. Since high risk must be balanced by high returns, firms with low social responsibility should earn high returns to justify the increased risk. Our data, however, suggest that firms low in social responsibility also experience lower ROA and stock-market returns than do firms high in social responsibility.

Second, accounting-based measures, particularly ROA, proved to be better predictors of corporate social responsbility than market measures. There may be several reasons for this trend. If perceptions of social responsibility are firm-specific (unsystematic), accounting measures of return should be more sensitive to them than stock-market measures, which reflect systematic market trends. Moreover, indexes are subject to managerial manipulation (Branch, 1983; Briloff, 1972, 1976) and tend to be stable over time (McGuire, Schneeweis, & Hill, 1986). Stock-market returns are more variable over time since they primarily respond to unexpected changes in information.

Perhaps most interesting is that prior performance is generally a better predictor of corporate social responsibility than subsequent performance. Thus, associations found between concurrent social responsibility and performance may partially be artifacts of previous high financial performance. Firms with high performance and low risk may be better able to afford to act in a socially responsible manner. Links between responsibility and subsequent financial performance may also be artifacts of prior high performance and the stability of accounting return data. Subsequent studies should attempt to separate the effects of prior, current, and future firm performance on the relationship between financial performance and corporate social responsibility.

CONCLUSIONS

The results of this study suggest several conclusions and avenues for future research. First, rather than examining the relationship between corporate social responsibility and a firm's subsequent financial performance, future research should investigate the influence of prior firm performance. In essence, it may be more fruitful to consider financial performance as a variable influencing social responsibility than the reverse. Previous studies have emphasized management preferences, industry, and organizational characteristics as influencing social responsibility (Arlow & Gannon, 1982; Sturdivant & Ginter, 1977). Second, the results suggest reduction of firm risk as an important benefit of social responsibility, one that previous research focusing on firm profitability and stock-market return has overlooked. Investigation of those two areas would do more to move research on social responsibility into theoretically and empirically fruitful areas than does investigation of concurrent measures (Ullmann, 1985).

This study also suggests that researchers give increased attention to the measure of firm performance used in studies of corporate social responsibility. Davidson, Worrell, and Gilberton (1986) noted that researchers have viewed the choice of performance variables as relatively straightforward compared to the problems of measuring corporate social responsibility. They further suggested that social responsibility may influence various aspects of firm performance in different ways. The inconsistency of results obtained using various financial performance variables supports that suggestion. Thus, this study adds to the growing body of literature indicating that the choice of performance variable can have substantive implications for the results of research and that researchers must carefully choose performance measures that are appropriate to the particular research question they are investigating. The results reported here also support the importance of controlling for risk in studies of social responsibility because adjusting for risk affects performance measures.

Although the *Fortune* data have provided a measure of corporate social responsibility new to the literature, the validity and appropriateness of this measure require further examination. As do other measures of social responsibility, the *Fortune* ratings may reflect the biases of the evaluators, who may not have defined or evaluated corporate social responsibility as other, less financially oriented evaluators might have. In addition, the context and purposes of the *Fortune* evaluation, which differ from those of other evaluations, may have influenced results.

However, major shortcomings in current research in corporate social responsibility have been the difficulty of measuring that concept (Abbott & Monsen, 1979; Ullmann, 1985) and consequent reliance on a limited set of measures. The introduction of a new measure of social responsibility helps reduce the mono-measure bias that has plagued the current body of research.

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APPENDIX

Alpha (α) was defined as return in excess of that due to general market movements, derived from the following market model:

$$R_i = \hat{\alpha}_i + \hat{b}_i R_{mt}\,,$$

where R_{it} = return on firm i in period t,

R_{mt} = return on index M (Standard and Poor's 500 Industrials) in period t,

$\hat{\alpha} = R - \hat{b}\overline{R}_m$, and

$$\hat{b} = \frac{\mathrm{Cov}\,(R_i, R_m)}{\mathrm{Var}\,(R_m)}\,.$$

Assets growth was the percent change in total assets (change in total assets/total assets). ***Average assets*** were beginning assets less ending assets divided by 2. ***Beta*** (β) was the covariance of a firm's stock-market return relative to the return of the stock market, standardized by stock-market return variance derived from the market model equation. Systematic, nondiversifiable risk. ***Ratio of debt to assets*** was total debt divided by total assets. ***Operating income growth*** was the percent change in operating income. Operating income is net sales less cost of goods sold and operating expenses before deducting depreciation, amortization, and depletion. ***Operating leverage*** was the extent to which fixed costs were used in a firm's operation. We used break-even analysis to measure the extent to which operating leverage was employed. Operating leverage = (sales−variable costs)/(sales−variable costs−fixed costs). ***Return on assets*** (ROA) is a measure of operating performance of how well assets have been employed since being received by a firm. Measured as (net income + interest expense)/average total assets. ***Sales growth*** was the percent change in gross sales and other operating revenue less discounts, returns, and allowances (change in sales/sales). ***Standard deviation in operating income growth***, a measure of the variability in operating income growth (OIG), was defined as

$$\sum_{i=1}^{n} (OIG - \overline{OIG})^2/n,$$

where n = number of years.

Standard deviation in total return (SDTR), a measure of the variability in stock-market return, was defined as

$$\sum_{i=1}^{n} (TR - \overline{TR})^2/n.$$

Total return was the percent change in stock-market valuation in year t, measured as [(price$_t$ + dividend$_t$) − price $_{t-1}$)]/ price$_{t-1}$.

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SELECTIVITY AND SELECTIVE PERCEPTION: AN INVESTIGATION OF MANAGERS' BELIEF STRUCTURES AND INFORMATION PROCESSING

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Dearborn and Simon's evidence of departmental bias in problem identification has prompted a scholarly concern about managers' information-processing capabilities. Through measures of managers' entire work histories, their belief structures, and three indexes of information processing in an ill-structured decision situation, the present research conceptually replicated and extended Dearborn and Simon's early work. Contrary to prevailing belief about managers' information-processing limitations, the managers in this investigation did not emerge as simple-minded information processors.

Managers routinely confront ill-structured, complex problems that challenge their cognitive capacities (Ackhoff, 1974; Mason & Mitroff, 1981; Mintzberg, Raisinghani, & Theoret, 1976; Schwenk, 1984; Ungson, Braunstein, & Hall, 1981). They must meet such challenges with limited information-processing capabilities (Miller, 1956). Previous research has suggested that in the interest of cognitive economy (Mischel, 1981; Taylor, 1975), managers construct belief structures that are simplified representations of their world (March & Simon, 1958; O'Reilly, 1983; Simon, 1955). These belief structures are considered indispensible to any decision maker, for without them, individuals would be overwhelmed by an information world of staggering complexity (Daft & Weick, 1984).

The simplified mental representations individuals employ to give their information environments form and meaning have been variously called implicit theories, cognitive maps, assumptions, schemata, and belief structures. The term "belief structure" seems to be the most accurate descriptor and, as such, was used throughout this research. Fiske and Taylor defined a belief structure as a "cognitive structure that represents organized knowledge about a given concept or type of stimulus. . . . It contains both the attributes of the concept and the relationships among the attributes" (1984:

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140). A belief structure reduces information-processing demands and renders information worlds manageable by structuring experience (Bower, Black, & Turner, 1979), by facilitating information acquisition and retrieval (Cantor & Mischel, 1977), and by providing a basis for inference (Snyder & Uranowitz, 1978). In short, a belief structure acts as a guide to an information domain.

Scholars have expressed concern, however, that belief structures can limit a manager's ability to understand an information domain. Weick, for example, pointed out that the unfortunate by-product of such simplified representations is that managers often must act on "impoverished views of the world" (1979: 68). In fact, a number of organizational disasters have been attributed to top managers' cognitive shortcomings. Starbuck and Hedberg's (1977) analysis of the Facit Corporation, Wyden's (1979) look at the Bay of Pigs invasion, Wilensky's (1967) examination of the saturation bombing of Europe in World War II, Shlaim's (1976) study of the third Arab-Israeli war, and Yates's (1983) investigation of the U.S. automobile industry have all attributed negative outcomes to the cognitive limitations of key decision makers. It is not known, however, if such attributions only serve to scapegoat decision makers or if they accurately depict the decision makers' cognitive limitations and their effects on organizational performance.

With the exception of some recent work by Jolly, Reynolds, and Slocum (1988), Walker (1985), and Walton (1986), there is little empirical evidence beyond the case studies cited concerning managers' information-processing capabilities. Nonetheless, management scholars have been pessimistic about managers' abilities to process information effectively. For the past 30 years, the management community has been warned about widespread problems of selective perception (Dearborn & Simon, 1958), perceptual screens (Cyert & March, 1963), personal bias (Stagner, 1969), collective blindness (Turner, 1976), tunnel vision (Mason & Mitroff 1981), functional fixedness (Katz, 1982), strategic myopia (Lorsch, 1985), and contested belief structures (Walsh & Fahey, 1986) among its decision makers. The concern shared by the scholars cited is that managers unknowingly may fall prey to suboptimal information-processing strategies. Moreover, recent social psychological work in the area of schematic information processing suggests that managers' decisions may be compromised by their information-processing limitations (Brewer & Nakamura, 1984; Taylor & Crocker, 1981).

The early work of Dearborn and Simon continues to be cited as evidence that managers suffer from systematic information-processing shortcomings. The thrust of their argument is that exposure to the goals and reinforcements of a particular department in an organization promotes a viewpoint that inclines a manager to attend only to certain information in a situation that relates specifically to the activities of that department. Dearborn and Simon's evidence for selective perception in the identification of company problems was cited in the management literature 60 times in a recent ten-year period (1978–87).

The intent of the present research was to conceptually replicate and extend Dearborn and Simon's work. They assessed both the departmental position of each of their managers and the content of the problems the managers identified in an ill-structured decision situation. The present research extended that effort by recording the entire work history for each manager studied, by assessing the content of each individual's belief structure, and by noting the effects of that belief structure not only on problem identification, but also on use of information and requests for additional information. With actual measures of the managers' belief structures, it was possible to examine just how selective their perception was.

RESEARCH ISSUES

The Content of the Managers' Belief Structures

Individuals hold many different belief structures about many different information domains. In order to examine the effects of a belief structure on managerial information processing, its broad content must be established. The research task is to select and assess a type of belief structure relevant to the information-processing task at hand. It seems likely that managers hold belief structures organized around attributes they believe characterize a successful organization. Although Dearborn and Simon (1958) did not speculate about the nature of each manager's hypothesized viewpoint, it is reasonable to argue that exposure to a department's goals and activities is likely to shape a manager's conception of organizational success. The observations of a number of theorists support that hypothesis. Srivastva, for example, argued that managers mentally create "an image of a desired future organizational state that can serve as a guide to interim strategies, decisions, and behavior" (1983: 2). Quinn asserted that "managers keep a clear vision in mind of where they would like to go and use all the valid analytical data they can as they guide their organizations toward a new strategy" (1980: 192). Dearborn and Simon's (1958) logic of departmental identification suggests that such visions may be organized by function in managers' minds.

Examining managers' belief structures concerning the characteristics of a successful organization finds theoretical precedent in Cohen's (1981) notion of a judgment goal. In her review of the literature, she found support for the proposition that peoples' goal orientations shape their definition of an information domain and guide information processing with respect to it. I assumed that managers attend to stimuli as they relate to their notions of organizational success, which in this research served as their judgment goal.

Hypotheses

The cornerstone of Dearborn and Simon's (1958) argument is that by virtue of the time spent in a particular department or function, managers develop a viewpoint that is consistent with the activities and goals of that department or particular function. Their logic is based on a simple exposure effect: exposure to the activities and goals of a department fosters a readiness in individuals to view their broader organizational worlds in a special light.

Thus, managers' functional work histories are likely to be represented in the specific content of their belief structures.

> *Hypothesis 1: A manager with a belief structure focused on a single functional domain is likely to have worked in that domain.*

The predicted information-processing effects of holding a particular belief structure are straightforward. Given that belief structures define individuals' domains of attention (Cohen & Ebbesen, 1979) and structure experience (Bower, Blank, & Turner, 1979), managers' problem identification in an ill-structured decision situation should occur within the bounds of their belief structures' content. That hypothesis, of course, attempts to replicate the logic and findings of Dearborn and Simon's research.

> *Hypothesis 2: In ill-structured decision situations, managers are only likely to identify problems that are from the same functional domain as the content of their belief structures.*

In addition to shaping the scope of problem identification, a belief structure should also affect the scope of information use in a decision-making process. Previous researchers have thought that, functionally, belief structures guide information acquisition and retrieval (Cantor & Mischel, 1977; Ross & Sicoly, 1979). Specifically, managers are only likely to use present information and seek out additional information in a manner consistent with the content of their belief structures.

> *Hypothesis 3: In ill-structured decision situations, managers are only likely to use information that is from the same functional domain as the content of their belief structures.*

> *Hypothesis 4: In ill-structured decision situations, managers are only likely to seek additional information that is from the same functional domain as the content of their belief structures.*

METHODS

Respondents and Procedures

The data for this study were collected from 121 midcareer managers enrolled in a two-year, part-time executive master's degree program at a large university. These individuals were either middle-level managers who were recognized by their employing organization as having senior-management potential or senior-level managers seeking to improve their management skills. The average respondent was 38 years old. Of the 121 individuals, 91 were men and 30 were women. At the time of data collection (1983), 97 of the respondents earned less than $50,000 per year and 24 earned more.

The director of the degree program informed the approximately 240 enrollees of the opportunity to take part voluntarily in a "research project on managerial decision making." Groups of no more than 30 individuals were asked to report to a large classroom at a prearranged time. They completed a sorting task and a case analysis.

Sorting task. Each manager was given a randomly ordered deck of 50 three-by-five-inch cards. Each card was labeled with one of 50 factors thought to be broadly related to the success of organizations. The factors were drawn from among Hambrick's (1981) functional areas, Miles's (1980) strategic constituencies, and the Profit Impact of Market Strategies variables (PIMS; Buzzell, Gale, & Sultan, 1975). The intent of this research-based selection procedure was to create a pool of items that might reasonably encompass all the managers' notions of organizational success. Moreover, I chose items that might represent the kind of departmental bias that Dearborn and Simon (1958) inferred existed. Although items such as "working hard" or "perseverence" may be suitable for investigation in another context, they would not enable assessment of departmental identification. Table 1 lists the items that were presented to the managers.

The managers were instructed to sort through the deck of cards to create two piles—one containing the factors that they thought were important to

TABLE 1
Items Employed in the Sorting Task

Profitability
Economy of scale
Employee morale
Legal expertise
Market share
Responsibility to stockholders
Internal R&D capability
CEO leadership
Debt/Equity ratio
Quality control
Unionization
Responsibility to creditors
Lobbying capabilities
Product line
External R&D accessibility
Management flexibility
Stock price
Responsibility to community
New products
Employee recruitment
Number of customers
Brand recognition
Consultants
Responsibility to employees
Strategic planning
Fixed & variable costs
Sophistication of technology
Equal employment opportunity
Public relations
Responsibility to government
Skillful sales force
Product research
Depth of management
Inventory planning
Vertical integration
Responsibility to customers
Personnel turnover
Macroeconomic environment
Market growth rate
Process research
Coordination among functions
Responsibility to yourself
Investment intensity
Patent advantages
Career ladders
Regulation environment
Market segmentation
Responsibility to suppliers
Basic research
Shared corporate culture

organizational success and one containing factors they thought relatively unimportant to success. Next, the managers were instructed to look through their pile of important factors and sort it into smaller piles of related factors. They were free to create as many piles as they wished. They were then asked to rank the piles in terms of the importance of the sets of related factors. The entire procedure took about 25 minutes.

Case analysis. A second 25-minute period was devoted to reading and analyzing a three-page case history developed expressly for this research. The Arbor Company case, which is available from the author, was designed to embody an ill-structured situation and to raise possible issues across a number of functional domains. The case portrays a company, with a mature product line, that is challenged by the advent of private-label and generic competition. After reading and underlining useful information in the case, the managers were asked to respond in writing to two open-ended questions. They were asked (1) to identify the problem or problems facing the Arbor Company and (2) to indicate what additional information they would need to assess the company's situation thoroughly. At the conclusion of the session, the managers were debriefed about the nature of the project and asked not to discuss their experience with others.

Measurements

Belief structures. The use of a sorting procedure to measure belief structures was borrowed from personality research. Rosenberg (1982) reviewed sorting methodology, which is demonstrated by the sorting procedure described in the previous section, and its application to psychological research, tracing that history back to Bruner, Goodnow, and Austin (1956). Such a procedure has three strengths: (1) It allows subjects to categorize a set of stimuli that are independent of an experimenter's own category system. (2) The output of the sorting procedure can be used as input for a number of multivariate analytic techniques, including multidimensional scaling. (3) It is a less cumbersome technique for estimating psychological distance between objects than Torgerson's (1958) method, which requires subjects to rate all pairwise similarities in a stimulus set. In this study, there were 50 stimuli in the set. Had the managers been asked to rate all pairwise similarities, they would have had to make 1,225 judgments [$N(N-1)/2$]. Rosenberg, Nelson, and Vivekananthan (1968) first used the sorting procedure with multidimensional scaling in their study of implicit personality theory. Subsequentially, Rosenberg and Olshan (1970), Schmidt (1972), and most recently, Sternberg (1985) and Walsh, Henderson, and Deighton (1988) have employed similar methodological strategies.

All the sorted piles of factors were rank-ordered by the managers in terms of importance to organizational success. The ranked groupings, which provided distance measures among the factors, were used as inputs to Takane's (1982a) individual-differences multidimensional scaling program. A discussion of that program and its role in belief-structure identification appears in the Results section.

Work history. Complete work histories of 107 of the 121 managers were drawn from the background information each had given the university administration. Only current job titles were available for the remaining 14 managers. The Appendix gives the information drawn from the university files.

Following Hirschman (1964), I computed a measure of functional diversity for each of the 107 managers as $\sqrt{\Sigma(X_i / X)^2}$, where X_i = number of years worked in a particular function and X = total number of years of work experience. Values for this statistic ranged from near zero, representing extreme functional diversity, to one, representing an entire career spent in one function. The mean for this group of managers was .84, with a standard deviation of .16.

Problem identification. The method employed here was similar to the one used by Dearborn and Simon (1958). In their study, managers with diverse backgrounds were asked to read a case and then write a brief description of what they considered to be the most important problem facing the company. I asked the managers in this research to identify the most important problem or problems facing the Arbor Company. The managers' responses were coded into five categories: accounting-finance, human relations, marketing, internal management, and external management. Dearborn and Simon classified their managers' responses into a set of only three departmental categories: sales, production, and accounting. In this research, the accounting-finance and marketing categories captured the function-specific information relevant to each domain. The human relations category encompassed such factors as the age and job tenure of particular managers and such issues as recruiting and turnover patterns. Internal management referred to problems related to timely and appropriate decision making on matters of intraorganizational concern. It captured the action orientation of the hypothetical management in the case. External management captured the same action orientation but focused on organization-environment issues. The internal and external management categories were added to the traditional functional categories to address scholarly interest in such orientations (Pearce, 1983).

Two research assistants were hired and trained to code the open-ended responses to the case analysis using the classification scheme just described. Each assistant coded all 121 cases on her own, and then the two met to resolve any differences and to reach an overall agreement for each respondent. Table 2 presents the interrater reliability indices for the problem-definition coding results. In line with the procedures established by Staw, McKechnie, and Puffer (1983), these reliability statistics represent the Pearson product-moment correlations between the proportions of problems identified by each coder in each of the five categories out of the total number of problems identified in the case analysis. The coding agreed on by the two research assistants was used in all subsequent analyses; use of the compromise coding follows Bettman and Weitz (1983). All the correlations are highly significant and of a magnitude to be expected in a fairly ambiguous task like this one.

Information use. Information use was measured as follows: managers were asked to underline any information in the case that was useful to them in identifying the problems facing the Arbor Company. The underlined information was coded as falling into one of the five areas identified in the preceding section. Each sentence in the case contained information that might be relevant to any of the five categories, so that as managers underlined case information that they considered diagnostically relevant, they were underlying information that fell into one or more of five coding categories. The information-use measure is simply the number of times a respondent underlined information contained in each of the five categories.[1] Since this coding procedure was an unambiguous mechanical task, one person coded the data.

Requests for additional information. Managers were also asked what additional information they would need in order to assess the Arbor Company's situation thoroughly. Following the same procedure used in the problem identification coding, the two research assistants coded responses to this open-ended question into the five areas. Table 2 presents the interrater reliability indexes for the coding results, again using the proportion of requests in each category as input for the correlations. All the correlations are large and highly significant and again allow confidence in the reliability of the measurement.

RESULTS

The Content of the Managers' Belief Structures

To identify the content of the managers' belief structures, I employed individual differences multidimensional scaling. As Schiffman, Reynolds, and Young noted, multidimensional scaling "recovers underlying structure among stimuli which is 'hidden' in the data" (1981: 7). I used the individual differences scaling algorithm developed by Carroll and Chang (1970) and amended by Takane (1982a,b) for use with sorting data because it identifies

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[1] The following two sentences from the Arbor Company case illustrate the coding scheme that was employed. The sentences are bracketed into fragments to illustrate how the coding procedure captured the information embedded in the case:

> [The results of Ashford's transformation from a small-time operator in a big-time company to a big-time operator in a small company] [became apparent this past year.] [After a spate of acquisitions] [of unrelated products and services,] [including some far afield from the company's traditional strength in supermarket products,] [Ashford had pushed Arbor's sales to $1.1 billion in 1982 from $105 at the time of the spin-off.]

If a respondent underlined information within the first bracket, he or she was coded as attending to human relations issues. Underlining in the second bracket was coded as attention to internal management concerns. The remaining brackets captured external management, marketing, marketing, and accounting-finance issues, respectively. The case and coding scheme are available from the author upon request.

TABLE 2
Interrater Reliability

	Correlations[a]		
Analyses	Rater 1–Rater 2	Rater 1–Agree	Rater 2–Agree
Problem identification			
Human relations	.69	.65	.82
Accounting-finance	.37	.56	.77
Marketing	.50	.69	.71
Internal management	.67	.73	.81
External management	.39	.57	.73
Additional information requests			
Human relations	.88	.92	.92
Accounting-finance	.77	.83	.90
Marketing	.62	.76	.87
Internal management	.75	.83	.88
External management	.46	.65	.80

[a] "Agree" represents a compromise coding that was used in all subsequent analyses in this study. All correlations are significant at $p < .001$.

differences among individuals as well as among stimuli, determining the weight, or relative importance, each person ascribes to each dimension. Takane's adaptation, which is called IDSORT, assumes that individuals perceive stimuli along a common set of dimensions, but that the importance or weight of each of those dimensions will vary across individuals. In fact, IDSORT allows an individual to give a weight of zero to a dimension.

A ten-dimensional solution best fit the data—in the aggregate, the belief structure representative of all the managers studied can be identified with this set of ten common dimensions. Such a solution is known as a group trait space, which represents a common set of dimensions along which individuals are thought to perceive stimuli. It is important to remember that the weight given to each dimension varies across individuals. The solution accounted for 30 percent of the variance.

It might be helpful to explain what a variance-explained statistic means in the context of multidimensional scaling. The sorting procedure established dissimilarity judgments among all the items in the stimulus set. Distances among those items were then estimated. Any IDSORT scaling solution would have defined precise distances among the items. The program passes repeatedly through various solutions to determine the one in which the distances among the items best match the distances estimated from the original dissimilarity judgments. The variance-explained statistic embodies the degree to which the interitem distances in the final IDSORT solution and the interitem distances estimated from the original dissimilarity judgments are similar, assessing the quality of this match. The 30 percent of variance explained in this research is generally consistent with typical individual-differences scaling results. For example, the values for variance explained in the solutions reported by Passer, Kelley, and Michela (1978), Takane (1982b), and Wish, Deutsch, and Biener (1972) were 35, 41, and 22 percent, respectively.

Table 3 shows the eigenvalues, scaling solutions, and loadings for each of the ten dimensions. Clusters of stimuli anchor the ends of each dimensions and thus define it. For example, dimension 5 is clearly marketing oriented. The polar opposite clusters labeled product development and product delivery indicate that managers think of marketing at least partially in terms of developing and delivering products to the marketplace. Similarly, each of the clusters of stimuli define the emergent perceptual dimensions that compose organizational success in the minds of these managers. As the table shows, I gave summary labels to each of the clusters.

Some of the factors load on more than one dimension and, as a result, some dimensions appear to overlap. Such results are common in attempts to represent complex information domains (Smith & Siegel, 1967). Dimensions 4 and 5, for example, share some marketing factors, which reflects the fact that in the respondents' minds, marketing issues such as market share, market growth rate, and sales force management are related to internal product development as well as to external environment. Similarly, the first four dimensions reflect the perception that an external orientation, related to each of four distinct internal concerns, is important to organizational success. The overlaps were not problematic for carrying out the remainder of the analyses.

An examination of the individual weights for each of the ten dimensions in the group trait space indicated how the managers differed in their views of organizational success, allowing assessment of Dearborn and Simon's (1958) hypothetical construct, the viewpoint. It was possible to determine who viewed organizational success along narrow functional lines. For example, the belief structure of a manager who gave a very high weight to dimension 3 and perhaps 6 and low weights to the other eight dimensions was dominated by financial concerns. A human-relations-oriented belief structure would have dimensions 1 and perhaps 8 weighted heavily; a marketing-oriented belief structure would evidence high weight on dimension 4 and perhaps 5 or 7; a manufacturing-oriented belief structure would show high weight on dimension 9 and perhaps 5 or 7; a leadership-oriented belief structure would be marked by high weights on dimensions 2 or 10 and perhaps 6 or 8; and finally, a generalist, a manager whose orientation to organizational success is not narrow and functionally specific, would have high weights on dimensions that crossed any of these five boundaries.

With .60 taken as the threshold for a high individual weight, the breakdown of managerial belief structures by type was as follows: human relations, $N = 12$; accounting finance, $N = 6$; marketing, $N = 7$; leadership, $N = 4$; manufacturing, $N = 3$; generalist, $N = 59$; other (no weight $> .60$), $N = 30$. In light of the relatively narrow work histories of the group as a whole (mean functional diversity = .84), it was interesting to see so many generalists. The logic of Dearborn and Simon (1958), of course, would predict far fewer

TABLE 3
The Ten-Dimensional IDSORT Scaling Solution[a]

	Positive Polarity		Negative Polarity	
Dimensions[b]	**Scaling Solutions**	**Loadings**	**Scaling Solutions**	**Loadings**
Dimension 1	Externalities		Human resource management	
(.564)	Legal expertise	.09	Employee morale	−.47
	Responsibility to government	.09	Responsibility to employees	−.44
	Lobbying capabilities	.09	Employee recruitment	−.39
	Economy of scale	.09	Employee turnover	−.35
	Investment intensity	.09	Career ladders	−.28
Dimension 2	Leadership		Externalities	
(.449)	CEO leadership	.46	Unionization	−.08
	Management flexibility	.46	Equal employment opprotunity	−.08
	Depth of management	.43	Lobbying capabilities	−.08
	Coordination among functions	.38	Patent advantages	−.07
	Strategic planning	.31	Number of customers	−.07
			Employee recruitment	−.07
Dimension 3	Finance		Externalities	
(.422)	Profitability	.61	Quality control	−.11
	Responsibility to stockholders	.44	Legal expertise	−.09
	Debt/equity ratio	.37	Lobbying capabilities	−.09
	Stock price	.35	Consultants	−.08
			Vertical integration	−.08
			Patent advantages	−.08
Dimension 4	Externalities		Marketing	
(.363)	Legal expertise	.14	Market share	−.42
	Responsibility to government	.13	Market growth rate	−.33
	Lobbying capabilities	.13	Product line	−.31
	Unionization	.11	Market segmentation	−.31
	Consultants	.11	Skillful sales force	−.28
	Regulation of environment	.11		
Dimension 5	Product development		Product delivery	
(.329)	Product research	.48	Market growth rate	−.11
	Internal R&D capability	.45	Number of customers	−.11
	New products	.33	Skillful sales force	−.10
	Sophistication of technology	.33	Market share	−.10
	Basic research	.30	Lobbying capabilities	−.10
Dimension 6	Responsibility to stockholders		Cost containment	
(.249)	Responsibility to creditors	.50	Economy of scale	−.11
	Responsibility to suppliers	.47	Costs	−.11
	Responsibility to customers	.43	Debt/equity ratio	−.10
	Responsibility to stockholders	.28	Stock price	−.10
	Responsibility to community	.27	Market share	−.09
Dimension 7	Marketing		Manufacturing	
(.214)	Market growth rate	.10	Inventory planning	−.61
	Market segmentation	.10	Quality control	−.57
	Market share	.09	Costs	−.39
	Lobbying capabilities	.09	Profitability	−.15
	Consultants	.09	Coordinating among functions	−.15
	Legal expertise	.09		

TABLE 3 (continued)

	Positive Polarity		Negative Polarity	
Dimensions[b]	Scaling Solutions	Loadings	Scaling Solutions	Loadings
Dimension 8	Responsibility to yourself		Responsibility to employees	
(.196)	Responsibility to yourself	.99	Employee morale	−.08
			Employee recruitment	−.08
Dimension 9	Economic environment		Production/engineering	
(.184)	Regulation environment	.82	Economy of scale	−.07
	Macroeconomic environment	.58	Process research	−.07
			External R&D accessibility	−.06
			Consultants	−.06
			Vertical integration	−.06
Dimension 10	Ensuring resource acquisitions		Public relations	
(.159)	Responsibility to suppliers	.10	Public relations	−.78
	Vertical integration	.08	Responsibility to community	−.48
	Consultants	.08	Responsibility to customers	−.31
	Economy of scale	.08		
	Investment intensity	.07		
	Responsibility to creditors	.07		

[a] Convergence reached in 27 iterations; variance explained = .30; N = 121.

[b] Eigenvalues for each dimension are in parentheses.

generalists. In addition, there were 30 managers in the "other" category, indicating no dimension weights of .60 or above. Those managers exhibited no firmly held orientation to organizational success, at least as reflected by this measurement procedure.

It should be noted that there is little guidance in the multidimensional scaling literature for establishing a high individual weight (Shiffman, Reynolds, & Young, 1981). I chose the criterion of .60 somewhat arbitrarily, using the conservative precedent established in the factor analytic tradition for what constitutes a significant factor loading. The mean individual weight of all those individual weights above the .60 criterion is .75, with a standard deviation of .11. The mean of those weights below this criterion is .21, with a standard deviation of .18.

Belief-structure Origins

The Appendix reports the job titles and work experience of all the managers in the five pure-type belief-structure groups (human relations, accounting-finance, marketing, leadership, and manufacturing). Contrary to what might be expected from Dearborn and Simon's results, no simple link emerged between work experience and the content of belief structures. To be sure, all the managers in the human relations group either worked in the personnel function or managed employees, and four of the seven managers in the marketing group had spent their entire careers in marketing. Nevertheless, there were enough anomalies in this qualitative analysis to suggest that the results did not replicate those of Dearborn and Simon.

A t-test compared the functional diversity statistic (described in the Measurements section above) for managers in the pure-type groups with the diversity statistic of the generalists. Hypothesis 1 predicted that the generalists (mean = 85.3; N = 55) would show more functionally diverse work experience than their peers in the pure-type groups (mean = 87.2; N = 25). Although the means are in the predicted direction, the difference is not statistically significant, so the data do not support Hypothesis 1.

The Effects of Belief Structures on Information Processing

To test the effects of the content of belief structures on information processing, I examined the responses of managers in four of the content groups: human relations, accounting-finance, marketing, and generalists. The leadership and manufacturing groups were dropped from the analysis because they were very small.

Table 4 presents the means and standard deviations for the three information-processing variables by the four content groups and the results of the analyses of variance testing the effects of content-group membership on the information-processing variables. Although it is not noted explicitly in Table 4, on the average managers identified 7.12 problems facing the Arbor Company, using 25.09 pieces of data in the case to arrive at this diagnosis, and requested an average 4.63 pieces of additional information to supplement their assessments. Thus, the average manager does not emerge as a parochial information processor.

In the study's test of Hypothesis 2, the four belief-structure content groups served as independent variables for a series of one-way ANOVAs testing for differences on the number of problems identified in each of the five areas of management. The four groups differed only with respect to identifying external management problems. A multiple range test using the least-significant difference (LSD) procedure established that the marketing group saw more external management problems (means = 2.57) than the human relations group (mean = 1.55) and the generalist group (mean = 1.74) at the .05 level of significance. These results offer some marginal support for Hypothesis 2.

A similar set of one-way ANOVAs was performed to test the hypothesis that the content groups would only use information from the same domain as their belief structures' content. As there were no significant differences between the four groups on their use of information in the case, Hypothesis 3 was not supported.

Hypothesis 4, which stated that managers would search for additional information that was from the same domain as their belief structures' content, received limited support in this investigation. ANOVAs were performed to test for differences in additional information requests within each of the four groups. Multiple range tests established that the accounting-finance group requested more accounting-finance information (mean = 1.67) than the marketing group (mean = .33), the human relations group (mean = .73), and the

TABLE 4
The Effects of Belief-Structure Content on Managerial Information Processing

Belief-Structure Content Group	Areas of Management: Human Relations	Accounting-Finance	Marketing	Internal Management	External Management
(a) Problem Identification					
Human relations (N = 11)					
Mean	1.09	1.09	2.73	1.46	1.55[a]
s.d.	1.05	1.14	2.05	0.69	0.69
Accounting-finance (N = 6)					
Mean	0.83	1.17	1.83	1.83	2.17
s.d.	0.41	1.17	1.17	0.75	1.17
Marketing (N = 7)					
Mean	1.14	1.00	3.00	1.00	**2.57**
s.d.	1.07	1.16	1.29	0.82	1.13
Generalist (N = 58)					
Mean	1.00	0.97	2.00	1.45	1.74[a]
s.d.	1.06	0.79	1.06	1.03	1.04
F (3,78)	0.12	0.13	2.24	0.83	1.90
(b) Information Use					
Human relations (N = 12)					
Mean	4.00	6.50	4.08	3.92	5.33
s.d.	3.39	3.53	3.03	4.14	3.63
Accounting-finance (N = 6)					
Mean	4.83	4.33	3.67	5.00	5.17
s.d.	1.72	2.42	2.58	2.45	4.36
Marketing (N = 7)					
Mean	3.14	8.86	3.43	3.86	6.00
s.d.	1.35	2.61	1.51	1.35	2.77
Generalist (N = 59)					
Mean	4.32	6.73	4.39	4.86	4.78
s.d.	2.78	4.43	2.50	3.14	3.01
F (3,80)	0.51	1.33	0.43	0.48	0.38
(c) Information Requests					
Human relations (N = 11)					
Mean	0.36	0.73[a]	1.46	1.00	1.00[a]
s.d.	0.67	1.01	1.37	0.78	0.78
Accounting-finance (N = 6)					
Mean	0.50	**1.67**	2.50	1.17	1.50
s.d.	0.55	0.82	2.26	1.17	1.38
Marketing (N = 6)					
Mean	0.00	0.33[a]	2.33	0.33	**2.50**
s.d.	0.00	0.52	1.86	0.52	2.35
Generalist (N = 58)					
Mean	0.38	0.86[a]	1.55	0.62	1.09[a]
s.d.	0.59	0.91	1.16	0.86	0.88
F (3,77)	0.92	2.40†	1.51	1.59	3.48*

[a] This mean is significantly different from means shown boldface by .05 or more.

†$p < .10$

*$p < .05$

generalist group (mean = .86) at the .05 level of significance. Additionally, the marketing group requested more external management information (mean = 2.50) than the human relations group (mean = 1.00) and the generalist group (mean = 1.09) at the .01 level of significance.

Finally, a more narrowly focused MANOVA was performed to test Dearborn and Simon's (1958) hypothesized departmental viewpoint effect on problem identification. Results for the effects of belief-structure content on problem identification within the information domains of human relations, accounting/finance, and marketing were not significant.

DISCUSSION

Organizational scholars have widely assumed that the belief structures managers use to deal with ill-structured problems, however necessary, have detrimental effects on their decision making. The results of this research on managerial information processing challenge that assumption. Although the managers studied were not asked to make actual decisions, the belief structures they brought to bear on the problems in this study were not particularly simplistic. Moreover, the dominant dimensions of their belief structures did not appear to significantly constrain their information processing. These managers did not seem to suffer from impoverished worldviews or parochial information use.

One goal of this research was to identify managerial belief structures empirically. Contrary to what Dearborn and Simon reported 30 years ago, few managers viewed their organizational worlds along narrow functional criteria. Three-quarters of this group either had strong conceptions of success that crossed functional lines or had no firmly held dominant conception of success. The selectivity of managers' perceptions may not be as constrained as Dearborn and Simon (1958) thought.

Axelrod (1976) concluded from his work that decision makers may hold more beliefs than they can handle. These results both support and challenge his conclusion. Managers may view organizational success on as many as ten dimensions. That finding supports Cyert and March (1963), Posner and Schmidt (1984), and Stagner (1969), all of whom argued that managers are concerned with a number of goals beyond simple profit maximization. However, among managers holding one or more dimensions of organizational success as very important, the average number of dimensions held to be important was only 2.34. What was the status of the other, lesser-weighted 7.66 dimensions? Are they the implicit beliefs that Axelrod felt decision makers should work to uncover? Or are they somehow less valued but nevertheless available for use if the occasion arises? Given the broad scope of information processing evident in these results, it would seem that the less important dimensions that cover the full ten-dimensional conceptual terrain of organizational success are available for use.

The lack of a strong correspondence between work experiences and the content of belief structures is intriguing. Hypothesis 1 would suggest that managers with a strong functional-area orientation within their belief structure would be working in that same area. However, in this research a chief financial officer, a vice president of marketing, and an assistant director of finance all shared a human relations belief structure. Similarly, there was a chief financial officer with a manufacturing belief structure, an assistant marketing manager with an accounting-finance belief structure, and a supervisory engineer with a marketing belief structure. Perhaps these managers are in the wrong jobs or work in companies with strong cultures that have supplanted the traditional functional orientations of their jobs; perhaps they have been exposed to a number of functional areas during their careers or have been paying close attention in their executive development classes. Nevertheless, it is entirely reasonable to imagine that a chief financial officer, for example, knows something about human resource management or might even feel that such practices are critical to organizational success, even if he or she has never worked in a personnel department.

The most striking finding to emerge from this research was the general lack of support for Hypotheses 2, 3, and 4. There was little evidence of parochial information processing. As Table 4 indicates, the average manager was able to identify problems and use information across the five domains. This is not to say that there was no support for the information-processing hypotheses, for some support emerged. Managers with a marketing belief structure identified more external management problems and requested more external management information than managers in the human relations and generalist groups, and the accounting-finance group sought out more accounting and finance information than the other groups. Nevertheless, even as those groups attended, and perhaps overattended, to their own areas of concern, they did not overlook the other domains. The marketing group identified 2.57 external management problems and also identified 6.14 other problems. Similarly, the accounting-finance group requested 1.67 pieces of additional accounting-finance information and also requested 5.67 pieces of additional information outside that domain. Perhaps those findings reflect the influence of the lesser-weighted belief-structure dimensions on information processing? Although the managers may not see those dimensions as of paramount importance to success, the evidence suggests that if an ill-structured problem triggers a concern in those areas, an executive decision maker may be able to employ them.

An Explicit Comparison with Dearborn and Simon

Since the results of this investigation appear to contrast sharply with the often-cited results of Dearborn and Simon's (1958) study, it is important to take note of the explicit similarities and differences between the two. Respondents, procedures, and results can be meaningfully compared.

The respondents in Dearborn and Simon's research were 23 middle managers, representing a single manufacturing company, who were attending a company-sponsored executive training program. This research included 121 middle- to upper-level managers, representing a variety of companies, who were attending a university-based executive master's degree program. The major differences, then, were the group sizes and the numbers of companies represented in each group. The present research benefited from greater diversity. The two groups were roughly equivalent in terms of occupational responsibility and interest in executive development. Unfortunately, we cannot compare the scope of educational experiences between the two.

The procedures employed in the two studies differed somewhat. First, the length of the cases varied. Although both cases were descriptive, not evaluative, the case in this research was about 1,000 words in length; the Castengo Steel Company case employed by Dearborn and Simon was about 10,000 words long. It is possible that managers can be more rigorous in their analysis of a short case. Second, Dearborn and Simon's managers were only asked to define the most important problem facing the company—although some defined as many as three problems. In contrast, the managers in the present study were asked to identify one or more problems facing the company, to share the information they used in this diagnosis, and to indicate what additional information they would need to be certain of their diagnosis. Thus, the present research offers a better assessment of information processing. In sum, Dearborn and Simon collected a small amount of information-processing evidence from the analysis of a fairly rich case, and the managers in this study provided us with a good deal of information-processing evidence from a thinner case. Given that the information-processing evidence subsumes the kind of evidence Dearborn and Simon collected, these differences are not problematic, but they should be noted just the same.

Finally, a review of Dearborn and Simon's results may indicate more similarity than dissimilarity to the present results. They published an appendix that reproduced the actual responses they received from their managers. A careful reading of those responses indicates that the sales managers identified sales, marketing, and organizational problems; the production managers identified organizational and sales problems; and the accounting managers identified problems in accounting, marketing, and organization. Ironically, it is not at all clear that Dearborn and Simon's data support their conclusion—the conclusion cited by so many subsequent researchers—that managers suffer from selective perception. Although the results of this conceptual replication of Dearborn and Simon's work largely contradict their own and everyone else's interpretation of their results, the actual results of the two studies do not appear to be contradictory.

Limitations and Future Research Needs

Several limitations of this investigation must be acknowledged. One limitation may be related to the content of the belief structure investigated. Although it is quite reasonable to propose the existence of a goal-oriented belief structure for organizational success, there may be other belief structures worthy of investigation. For example, studies could be conducted that would examine belief structures for organizational survival or organizational growth. The fact that 30 managers gave no individual dimension a weight greater than .60 and thus did not exhibit any firmly held orientation toward organizational success suggests that this study did not capture a relevant belief structure for those individuals.

In addition, the group-trait-space solution that emerged explained only 30 percent of the variance. It may be that the managers with no high dimension weights did hold a firm orientation to organizational success but that group-trait-space solution did not accurately represent their dissimilarity judgments. Future researchers should work to boost this variance-explained statistic to clarify whether respondents actually hold a particular belief structure.

Third, the participants in this study were all very successful managers selected by their organizations to earn an advanced degree in management. The results suggesting that these managers do not hold narrow belief structures or show evidence of simple-minded information processing may not generalize to managers with more modest accomplishments.

Fourth, the setting for the data collection triggers a number of concerns. Would the results hold in a pressured business environment? It may be that the tranquility and the demand characteristics possibly inherent in a university setting prompted the managers to engage in more exhaustive information processing than normal. Moreover, their ability to invoke a cross-functional perspective may reflect the fact that they learned their lessons well in the classroom. Away from the university setting, pressures of various kinds may produce a "threat-rigidity" response (Staw, Sandelands, & Dutton, 1981: 502) in which managers act only on the most dominant dimensions of their belief structures. Finally, both Dearborn and Simon and I assumed that exposure to the activities of a particular department or function promotes the development of a belief structure or viewpoint that systematically affects managerial information processing. As I have speculated, many different kinds of exposure may promote such development, including direct and vicarious exposure and classroom experiences. The present evidence indicates that managers hold rather broadly focused belief structures, but it may be that political realities or other motivations may prompt a manager to act on a narrower, more self-interested set of dimensions. Although Dearborn and Simon's (1958) work is similarly limited, future research must examine the effects of managers' belief structures on information processing and decision making in field settings.

Additional research is also needed to examine the origins of belief structures and their relationship to decision environments. We need to know much more about how belief structures develop and change. The inconclusive relationships between direct work experience and belief-structure content reported here only fuel interest in this topic. Does vicarious learning contribute to the development of belief structures? Do groups and organizations instantiate belief structures, as Calder and Schurr (1981) suggested? Investigators need to pursue a line of research begun by Walsh, Henderson, and Deighton (1988) to learn much more about how the aggregation of belief structures in a group setting affects group-level information processing and decision making. Moreover, what are the roles of individual differences in belief-structure development and change? By examining only midcareer managers, the present investigation suffered from restriction of range. Future research, then, should also trace the development of work-related belief structures from childhood to retirement.

Finally, we need to direct our attention to the relationships between managers' belief structures, their decision environments, and their organization's effectiveness. Researchers need to move to the field to examine managers' belief structures, their fit or misfit with their decision environments, and the effects of such fit on the decisions they make. Precisely what are impoverished belief structures? How do they develop? The appropriate research question may not be if managers hold impoverished belief structures, but rather, when are their belief structures impoverished. An understanding of both a belief structure and the decision environment it represents is needed before a belief structure can be pronounced impoverished. And perhaps most important, how do belief structures affect strategy making? Do strategy makers' belief structures shape strategy formation? Do belief structures influence their response to strategic opportunities and threats? Are belief structures, in fact, sometimes responsible for the kinds of organizational disasters reported by Starbuck and Hedberg (1977), Wilensky (1967), and others?

CONCLUSIONS

The fact that Dearborn and Simon's (1958) evidence of selective perception is still so often cited reflects a good deal of concern about the effects of cognitive simplification on the practice of management. Although the case-study documentation of failures caused by managers acting on what Weick might consider to be "impoverished views of the world" (1979: 68) is impressive, the present research suggests that concern in the management community may be fueled by what Tversky and Kahneman (1973) would call an availability heuristic. The vividness of the examples of decision-making blunders that come so easily to mind might be causing researchers to overestimate the frequency of their occurrence. In fact, Christensen-Szalanski and Beach found that psychologists cite evidence of poor information-processing performance six times more often than they cite evidence of good performance. They argued that this citation bias fuels our perception of the "hopelessness of human judgment and decision performance" (1984: 75).

Perhaps we have been too quick to attribute organizational maladies to the cognitive shortcomings of organizational decision makers. Defying scholarly concern about cognitive limitations and decision failures, the managers in this study did not emerge as simple-minded information processors. Nevertheless, it is still an open question whether or not such information processors can make simple-minded mistakes. The present research called attention to these issues, challenged researchers' perhaps simple-minded view of the simple-minded manager, suggested a set of refined research questions, and offered an accessible methodology for examining these issues in subsequent investigations.

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APPENDIX

Job Titles and Known Work Experience of Managers by Functional Belief Structures

Human-Relations Belief-Structure Group

Assistant director of finance; director of development; attorney (and C.P.A.) with 7 years as tax attorney; director of staff development and continuing education; personnel manager with 4 years as a labor negotiator and 9 years in current job; associate director of international and field systems; vice president and head of a municipal-bonds trading department; executive vice president, plant operations, with 3 years as shop foreman, 3 years as designer and purchasing agent, 1 year as production control manager, 3 years as plant superintendent, and 10 years in current job; director of building engineering with 9 years in that department leading to the current job; manager, financial planning and analysis, with 2 years as accountant trainee, 2 years in the military, 1 year as traveling internal auditor, 2 years as staff accountant, 1 year as internal corporate auditor, 2 months as budget forecasting manager, 1 year as general manager, and 9 years in current job; director of engineering with 6 years as consulting engineer, 3 years as project manager (engineering), 1 year as department head (engineering), 1 year as project manager (engineering), and 2 years in current job (included responsibility for production, marketing, and finance); vice president, marketing, with 8½ years in systems and 8½ years in marketing leading to current job.

Marketing Belief-Structure Group

President and hotel general manager with 3 years planning and coordinating hotel renovation and 4 years in current job; manager of corporate planning with 3 years as market research analyst, 3 years as market research manager, and 3 years in current job; controller with 8 years as bookkeeper and charge card supervisor, 3 years as assistant controller, and 7 years in current job; senior product manager with 10 years as salesman (became district sales manager), 2 years as product manager, and 2 years in current job; supervisory engineer with 3 years as engineer in the field, 5 years as staff engineer, and 6 years in current job; area sales manager with 14 years in marketing function leading to current job; vice president, merchandising, with 1 year as assistant factory manager, 1 year as product manager, 1 year as director of marketing, 3 years as buyer, 3 years as vice president in merchandise replenishment, and 2 years in current job.

Accounting-Finance Belief-Structure Group

Assistant marketing manager with 1½ years as newspaper correspondent, 4 years as magazine editor, 1 year as trade journal editor, and 1 year in current job; associate to the president, health care, with 3 years as health-care planning associate, 3 years as health-care executive assistant, and 4 years in current job; manager supermarket field sales with 3 years in management training program, 1 year as grocery department manager, 2 years as store manager, 3 years as regional supervisor, and 1 year in current job; managing director, shops, with 6 years as railroad engineer, 4 years as railroad mechanic, 4 years as regional mechanical supervisor, 7 years as equipment engineering director, 3 years as vice president fleet management, and 3 years in current job; buyer; regional manager with 4 years as advertising salesman and 7 years as advertising manager, now regional manager.

Leadership Belief-Structure Group

Manager, corporate internal audit, with 9 years as public accountant and 2 years in current job; library director with 4 years in current job; data processing manager with 9 years as systems engineer and 5 years in current job; television news reporter with 13 years in current job.

Manufacturing Belief-Structure Group

Senior research technologist; associate director of hospital volunteer service with 2 years as health-care administrative assistant and 10 years in current job; chief financial officer, hospital, with 6 years as public accountant and audit manager and 9 years as director of finance, leading to current job.

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ORGANIZATIONAL ASSIMILATION OF INNOVATIONS: A MULTILEVEL CONTEXTUAL ANALYSIS

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This study examined the assimilation of innovations into organizations, a process unfolding in a series of decisions to evaluate, adopt, and implement new technologies. Assimilation was conceptualized as a nine-step process and measured by tracking 300 potential adoptions through organizations during a six-year period. We advance a model suggesting that organizational assimilation of technological innovations is determined by three classes of antecedents: contextual attributes, innovation attributes, and attributes arising from the interaction of contexts and innovations

Why and how do organizations evaluate, adopt, and implement innovations? Few research questions have spanned so many social science disciplines, elicited such an outpouring of empirical research, and yielded so few unequivocal findings. The literature on innovation has been described as "fragmentary" (Kelly & Kranzberg, 1978: 164), "contradictory" (Kimberly & Evanisko, 1981: 698), and "beyond interpretation" (Downs & Mohr, 1976: 700). No real theory has emerged that permits researchers to predict the extent to which a given organization will employ a given innovation (Mohr, 1982). The literature offers little guidance to those seeking to influence the rate or direction of technological change (Tornatzky et al., 1983). From both theoretical and practical perspectives, our cumulative knowledge of why and how organizations adopt and implement innovations is considerably less than the sum of its parts.

This article draws on extensive observations of organizations assimilating technological innovations conducted as part of a six-year field study (Greer, Greer, & Meyer, 1983). *Assimilation* is defined here as an organizational process that (1) is set in motion when individual organization members first hear of an innovation's development, (2) can lead to the acquisition of the innovation, and (3) sometimes comes to fruition in the innovation's full acceptance, utilization, and institutionalization.

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Our research, which concerned the assimilation of medical innovations into community hospitals, focused on discrete decisions about specific equipment. Taking decisions rather than organizations as the unit of analysis broke with a tradition of conceptualizing innovativeness as a global, systemic property of organizations. Instead, our study approached each hospital's assimilation of each innovation as the unfolding of a unique series of choices, attracting different participants, triggering different processes, and subject to shifting incentives and constraints. As a physician we interviewed put it:

> On one end you have the doctors. A lot of us want the very latest medical equipment—both for our patients' sake and for our own sake. Medicine's extremely competitive . . . there's competition for referrals and competition to be known as the guy who can handle a really tough, challenging case. This sort of competition generates incessant pleas for new equipment.
>
> On the other end you have the board members. They ask, "How are we ever going to pay for all this?" As a rule, doctors and boards never meet, so the decisions are made separately, at different levels, according to different criteria. These can range from malpractice liability to the hospital's competitive effectiveness.
>
> But sandwiched in the middle, between the doctors and the board, you have the administrators. They're the people who have to listen to the arguments and threats flowing in from both ends, and ultimately, they're the ones . . . who somehow concoct a capital budget.

CONCEPTUAL AND METHODOLOGICAL ISSUES

The doctor's description crisply summarizes this study's perspective on the organizational assimilation of technological innovations. In characterizing assimilation as a dynamic, multilevel choice process, he underscored four clusters of conceptual and methodological issues for innovation researchers.

Antecedents of Assimilation

The doctor cited factors ranging from malpractice liability to organizational strategy as influencing the acquisition of innovative medical equipment. After investigating a number of potential antecedents, researchers, too, have found fragmentary evidence linking the adoption of innovations to attributes of environments, organizations, leaders, members, and the innovations themselves. But most of the links are tenuous. Some investigations have retrospectively inferred antecedents from correlational analysis (Aiken & Hage, 1971; Daft & Becker, 1978; Moch & Morse, 1977), but such analyses mask underlying causal processes. Most comparative studies with large samples have examined short lists of predictor variables. Consequently, little is known about the relative influence of the predictors (Baldridge & Burnham, 1975; Kimberly & Evanisko, 1981), and virtually nothing is known about how they interact (Downs & Mohr, 1976).

Processes of Assimilation

Innovations, the doctor noted, are not adopted instantaneously by individual decision makers. They infiltrate organizations, moving between social units and passing through such phases as awareness, evaluation, adoption, utilization, and institutionalization (Beyer & Trice, 1978; Daft, 1982; Ettlie & Vallenga, 1979). Few studies, however, have examined the choice processes that precede adoption (Tornatsky et al., 1983) or assessed the utilization of innovations after their adoption (Kimberly, 1981).[1] Although there are some notable exceptions (cf. Beyer & Trice, 1978; Nutt, 1986; Pelz & Munson, 1982), much of the implementation literature is impressionistic. The few studies systematically measuring implementation over time (Beyer & Trice, 1978; Yin, 1977) have investigated only one or two innovations. Consequently, their findings can be challenged on the grounds they are idiosyncratic to the particular innovations studied (Bigoness & Perrault, 1981).

Effects of Assimilation

Medical innovations, the doctor pointed out, have multiple consequences for multiple participants in hospitals. The implication for researchers is that refined methods of measuring the antecedents of adoptions may produce few benefits unless matching refinements in measures of effects are also introduced. Downs and Mohr (1976) pointed out that innovation researchers have seldom measured their dependent variables with precision. After reviewing the literature, those authors reported that the most common measure merely established the date of an innovation's initial adoption and the next most common measure simply drew a nominal distinction between adoptions and nonadoptions.

Recently, a number of researchers have taken the organization as their unit of analysis and measured innovativeness as a global property (Aiken & Hage, 1971; Dewar & Dutton, 1986; Kimberly & Evanisko, 1981; Mohr, 1969). The apparent rationales for aggregating adoptions of innovations include ease of measurement (Tornatzky et al., 1983), higher reliability and generalizability of findings than single-innovation studies provide (Downs & Mohr, 1976), and the implicit assumption that because innovations benefit organizations, the more adoptions the better (Kimberly, 1981). Whatever the reason, the total number of innovations adopted has been the primary dependent variable in many recent studies. Researchers have generally assigned each organization a score reflecting the number of nominal adoptions it made, drawing on either an open- or a closed-ended list of innovations. However, in taking this aggregated approach, researchers are assuming implicitly, and probably inappropriately, that different innovations are homogeneous (Downs & Mohr, 1976; Tornatzky & Klein, 1982).

The practices cited aptly illustrate Weick's contention that "we typically do a fine grained analysis to isolate separate causes but then do a coarse grained analysis when we examine effects" (1974: 366). When dissimilar innovation outcomes are lumped together and treated as a single effect, efforts taken to measure antecedents carefully are rendered pointless. Moreover, such lopsided efforts lead researchers to conclude erroneously that an "effect" might have arisen from any one of many possible causes. This situation, which Hannan (1971) termed overdetermination, can be remedied by carefully discriminating between subtle differences in effects.

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[1] In a meta-analysis of 75 studies of innovation characteristics, Tornatzky and Klein (1982) found only 5 studies that measured both adoption and implementation.

Units of Analysis

Hospitals assimilate medical innovations, the doctor said, through multiple decisions, "made separately, at different levels, according to different criteria." Researchers trying to study temporal processes affected by multilevel factors have to grapple with two formidable and intertwined problems—selecting both levels of analysis and time frames for data collection. Specifying levels correctly is a precondition for educing operational measures of constructs, for selecting appropriate methods for aggregating data, and for concatenating variables into meaningful causal chains (Firebaugh, 1978; Freeman, 1979; Hannan, 1971; Roberts, Hulin, & Rousseau, 1978). Misspecifying them can introduce unobtrusive errors that cascade through research designs. Other difficulties ensue when data are aggregated across time in perfunctory ways. Severe inferential errors, for instance, may result when data collected at different times are pooled (Tornatzky et al., 1983), when research designs allow insufficient time for hypothesized causal processes to unfold, or when past effects are predicted from present causes (Kimberly, 1980).

Programmatic innovations are thought to be more subject to alteration during implementation than are technological innovations (Pelz & Munson, 1982). However, even innovations embodied in new equipment have few inherent attributes that can be ascertained unequivocally without reference to a specific organization at a specific time (Downs & Mohr, 1976). Identical pieces of new medical equipment might solve a long-standing problem for one hospital, create an opportunity for diversification in a second, and jeopardize well-established services in a third (Meyer, 1985). Similarly, organizations have few inherent characteristics that govern the assimilation of all innovations. The decision processes evoked in a particular hospital when ultrasonic imaging is proposed may scarcely resemble those evoked when laser surgery is proposed.

Researchers who construct innovativeness scores by adding nominally measured adoptions remove specific innovations from their social contexts, ignore pre- and post-adoption events, and raise the level of analysis in ways that are rarely acknowledged. They measure an aggregate construct— adopting lots of different innovations. But when the utilization of specific innovations is not assessed, their ultimate effects are obscured.

Conceptual and Methodological Prescriptions

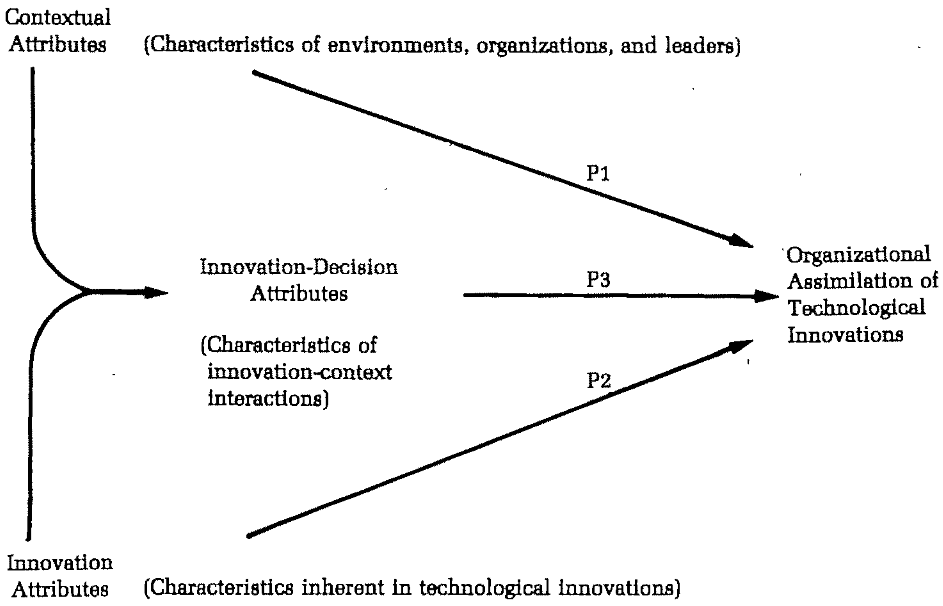
If problems discussed above have contributed to the malaise afflicting innovation research, what remedies are available? This study's approach was to bring some refinements in research methods to bear upon a revised conceptualization of the adoption of innovations in organizations.

Those methodological refinements can be expressed as four prescriptions. We recommend (1) devising sensitive measures of the assimilation of innovations, (2) examining multiple antecedents of multiple innovations, (3) collecting both objective and perceptual data concerning antecedents, and (4) avoiding the aggregation of data across innovations, organizations, or time, unless theoretical justifications exist for doing so.

Figure 1 outlines our conceptual model. It suggests that three factors determine the assimilation of technological innovations into organizations: attributes of innovations, attributes of organizational contexts, and attributes arising from the interaction of innovations and contexts (termed "innovation-decision attributes" throughout this article). We evaluated the model by examining three general propositions:

> *Proposition 1: Contextual attributes influence organizational assimilation of innovations: characteristics of environments, organizations, and leaders each account for unique variance in assimilation.*
>
> *Proposition 2: Attributes of innovations influence organizational assimilation of innovations: technological characteristics of innovations account for unique variance in assimilation.*

FIGURE 1
A Model of Innovation Assimilation


Contextual Attributes
(Characteristics of environments, organizations, and leaders)
P1
Innovation-Decision Attributes
(Characteristics of innovation-context interactions)
P3
P2
Organizational Assimilation of Technological Innovations
Innovation Attributes
(Characteristics inherent in technological innovations)

> *Proposition 3: Innovation-decision attributes influence organizational assimilation of innovations: characteristics arising from the interaction of innovations and contexts account for unique variance in assimilation.*

Research Setting

The analysis set forth in this article drew upon a six-year field study investigating the diffusion of medical innovations into community hospitals[2] (Greer, 1984, 1986; Greer, Greer, & Meyer, 1983; Meyer, 1984, 1985). The central objective of that research was to build a grounded theory (Glaser & Strauss, 1967) by continuously comparing theory and data until adequate conceptual categories had been developed. Other articles have described the characteristic process by which hospitals were found to assimilate externally developed equipment (Greer, 1986; Meyer, 1985). Briefly, we have argued that an innovation presents an adoption opportunity to a hospital and triggers a set of formal and informal decision process that may end in awareness, evaluation, adoption, or implementation. This process unfolds within a multilevel context. Specifically, discrete medical innovations are apprehended, evaluated, adopted, and implemented within the context of formal capital budgeting systems, medical and administrative leadership, organizational structures and strategies, and constraints originating in a hospital's market environment.

Stages of Assimilation

Table 1 depicts the assimilation of medical innovations as a process consisting of three primary decision-making stages and nine substages.[3] It adapts prior frameworks (Ettlie & Vallenga, 1979; Rogers, 1983; Zaltman, Duncan, & Holbeck, 1973) to the context of community hospitals' adoption of medical equipment (Meyer, 1985). We portray innovations as triggering a predictable sequence of cognitive, social, and organizational events. Specifically, learning of an innovation's development often causes physicians to consider its feasibility in their hospital and to discuss the matter informally with colleagues. Those events may give rise to formal organizational budgetary evaluations. Medical and financial concerns tend to predominate in the early stages of hospitals' capital budget evaluations, with political and strate-

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[2] This article's first author was a member of the research team that collected these data with support from the National Center for Health Services Research, #R01 HS03238, Ann Lennarson Greer, Principal Investigator.

[3] Some theorists have questioned the validity of stage models (March & Olsen, 1976; Mintzberg, Raisinghani, & Theoret, 1976; Witte, 1972). Although the available evidence is meager, stage models seem more applicable to innovations embodied in concrete products than to those embedded in adaptable processes (Pelz & Munson, 1982). They also seem more applicable to innovations triggering preprogrammed decision routine instead of eliciting intuitive strategic choices (Norman, 1971). These considerations suggest that a stage model is appropriate for investigating equipment-embodied innovations whose adoptions hinge on satisfying medical, fiscal, political, and strategic criteria codified in hospitals' capital budgeting systems.

TABLE 1
Decision-making Stages in the Assimilation of Medical Innovations

Knowledge-Awareness Stage
1. Apprehension. Individual organization members learn of an innovation's existence.
2. Consideration. Individuals consider the innovation's suitability for their organization.
3. Discussion. Individuals engage in conversations concerning adoption.

Evaluation-Choice Stage
4. Acquisition proposal. Adoption of equipment embodying the innovation is proposed formally.
5. Medical-fiscal evaluation. The proposed investment is evaluated according to medical and financial criteria.
6. Political-strategic evaluation. The proposed investment is evaluated according to political and strategic criteria.

Adoption-Implementation Stage
7. Trial. The equipment is purchased but still under trial evaluation.
8. Acceptance. The equipment becomes well accepted and frequently used.
9. Expansion. The equipment is expanded, upgraded, or replaced with a second-generation model.

gic concerns arising subsequently. The acquisition of innovative equipment ushers in a trial period when actual results are evaluated. Auspicious results generally lead to acceptance and utilization, setting the stage for subsequent adoptions of the innovation.

However, the outcomes of adoption proposals are problematic at each stage. Informal discussions may reveal that an innovation does not merit serious consideration; formal proposals risk rejection on medical, fiscal, or political grounds; and acquisition does not ensure utilization.

METHODS

Innovation-Decision Research Design

The present analysis examined 300 processes of organizational decision making. We obtained the set of decision processes by investigating the extent to which 25 hospitals assimilated 12 medical innovations. That configuration constitutes an innovation-decision design in which the "unit of analysis is no longer the organization, but the organization with respect to a particular innovation, no longer the innovation, but the innovation with respect to a particular organization" (Downs & Mohr, 1976: 706). Data were collected using field interviews, questionnaires, organizational documents, and secondary sources.

Innovations. Medical innovations were defined as significant departures from previous techniques for diagnosis, treatment, or prevention, as determined by the collective judgments of experts in the field (Greer et al., 1983). Our objectives were to identify a representative array of new technologies, to study their adoption by organizations rather than individuals, and to observe adoption processes concurrently and prospectively. Accordingly, a panel of local and national medical experts assisted the research team in identifying a set of 12 innovations meeting three conditions. An innovation had to be (1) at an early stage in the diffusion process, (2) embodied in mechanical equipment, and (3) too costly and complex for individual physicians to adopt. The Appendix describes the innovations studied and the process of selecting them.

Organizations. The organizations studied included all 25 private, nonprofit hospitals within one federally designated Health Systems Area encompassing a large midwestern city and its rural hinterland. The hospitals had a similar goal—treating a broad range of short-term illnesses—and they encountered similar regulatory frameworks, labor markets, and standards of professional practice. However, they varied substantially along organizational dimensions such as size, structural complexity, and strategy and along environmental dimensions such as urbanization, market demographics, and wealth.

Informants. Interviews[4] were conducted between 1976 and 1980 with physicians ($N = 206$), administrators ($N = 70$), board members ($N = 46$), and nurses ($N = 33$) affiliated with the 25 hospitals. Interviewees included each hospital's chief executive and financial officers, convenience samples of board members and nurses, and physicians from 12 specialty areas[5] identified by the panel of medical school faculty members as eligible to use the studied innovations or likely to refer patients to users frequently. Interviewees were asked to describe an innovation's entire history in the hospital, noting their own initial awareness, identifying sponsors and opponents, describing progress through the capital budgeting system, and reporting final outcomes. The resulting interviews averaged about 90 minutes in length and generated over 3,000 pages of transcripts.

Measuring the Dependent Variable

Our fieldwork allowed us to chart the assimilation of each innovation into each organization over time. In most cases, members of the research team were able to observe choice processes as they unfolded. When that was not possible, informants reconstructed the process retrospectively.[6] To help track adoption proposals, we enlisted informants' assistance in mapping the formal medical capital-budgeting system in each hospital on a flowchart (see Figure 2). The resulting charts varied in form and complexity, but each portrayed a multistage annual budgetary cycle, with adoption proposals originating in medical staff departments and going to a series of organizational destinations for various forms of evaluation. Proposals typically could be returned to certain destinations for reevaluation, and they had to bypass several routes to possible abandonment before receiving final budgetary approval.

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[4] Interviews were conducted in three waves: between March and August 1976 ($N = 70$), between October 1977 and April 1979 ($N = 23$), and between May and October 1980 ($N = 285$). Overall, 71 percent of those contacted agreed to be interviewed. Faculty members and graduate students conducted the interviews. Appropriate steps were taken to enhance reliability (cf. Greer et al., 1983).

[5] Physician interviewees were drawn from the following specialties: pathology ($N = 22$), radiology ($N = 31$), cardiac surgery ($N = 11$), neonatology ($N = 4$), ophthalmology ($N = 21$), gastroenterology ($N = 14$), cardiology ($N = 17$), obstetrics and gynecology ($N = 18$), internal medicine ($N = 26$), family practice ($N = 16$), anesthesiology ($N = 6$), and general surgery ($N = 6$).

In order to create a dependent variable for regression analyses, a 9-point Guttman-type scale was derived from the decision-stage model presented in Table 1. We then performed content analyses of the field interview transcripts, inspected the secondary data, and conducted telephone interviews to determine how far each assimilation process had progressed as of March 1981. The Appendix describes these procedures. In this fashion, each of the 300 innovation decisions was assigned an assimilation score on the following scale: (1) Members were aware of this innovation. (2) Members considered this innovation for this hospital. (3) Members discussed the equipment informally with colleagues. (4) Members formally proposed purchase of the equipment. (5) The equipment was approved on medical and financial grounds. (6) The equipment was approved on political and strategic grounds. (7) The equipment was purchased and under trial evaluation. (8) The equipment was accepted widely and used frequently. (9) The equipment was expanded, upgraded, or replaced with a second generation.

Measuring Independent Variables

Reviews of the innovation literature (Greer, 1977; Tornatzky et al., 1983; Rogers, 1983), coupled with our own fieldwork (Greer et al., 1983), suggested that attributes of innovations, attributes of organizational contexts, and interactions between innovations and contexts influence assimilation.

In an effort to verify, clarify, and extend this perspective, in the present analysis we examined five clusters of predictors measuring attributes of environments, organizations, leaders, innovations, and innovation-decision processes. To build on prior research, we included variables that have previously been found to be related to organizational adoptions of innovations. To enable causal interpretations of results, all secondary data were collected prior to the innovation assimilations they are used to predict. Some data

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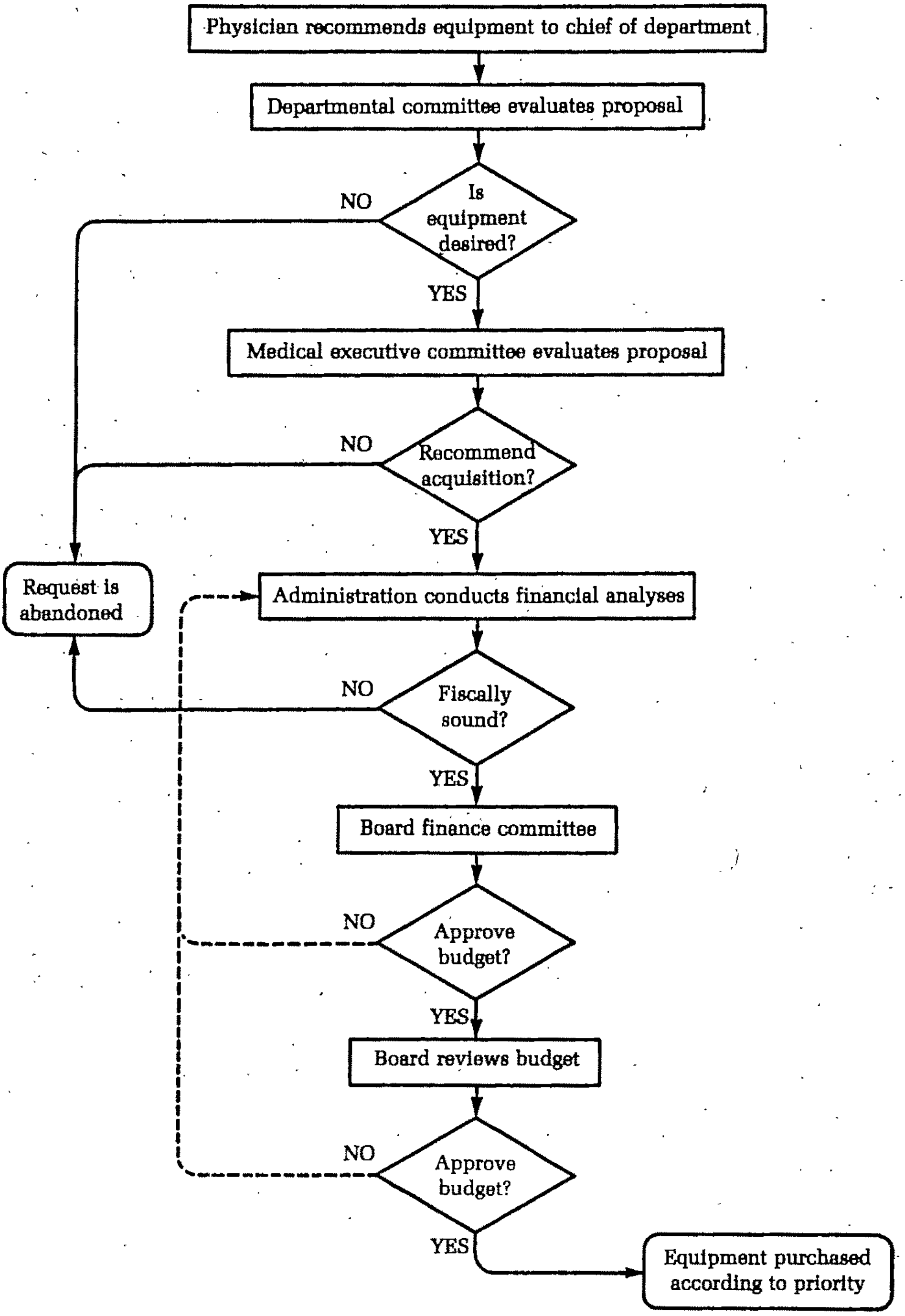
[6] Only retrospective data could be gathered from informants for 75 of the 300 innovation decisions because the equipment in question had been purchased before the field interviews began. For the remaining 225 innovation decisions, we obtained varying mixtures of prospective, concurrent, and retrospective reports. Although the possibility of some retrospective biasing cannot be ruled out, we sought to reduce it by framing interview questions that focused on concrete events and by using multiple informants. Even in the 75 cases where all reports were retrospective, no substantial discrepancies were observed when reports from different informants were compared. It seems unlikely that nurses, doctors, administrators, and board members would provide biased reconstructions that were equivalent.

FIGURE 2
Sample Flowchart of a Capital Budgeting System


Physician recommends equipment to chief of department
Departmental committee evaluates proposal
Is equipment desired?
NO
YES
Medical executive committee evaluates proposal
Recommend acquisition?
NO
YES
Request is abandoned
Administration conducts financial analyses
Fiscally sound?
NO
YES
Board finance committee
Approve budget?
NO
YES
Board reviews budget
Approve budget?
NO
YES
Equipment purchased according to priority

were obtained by replicating established measures, and other measures were developed especially for this study. Table 2 lists the independent variables we examined. It cites some prior studies that have related them to innovation adoption, provides operational definitions, predicts bivariate relationships to adoption, and specifies data sources. The following sections briefly describe the five clusters of predictors, and the Appendix presents some further methodological details.

Environmental variables. Hospitals transact with their environments to acquire inputs such as patients, capital funds, and legitimacy. Many theorists have contended that organizations do not merely respond to preordained environmental conditions but actively create the environments they inhabit through processes of attention and choices of markets, products, and services (Weick, 1979). However, researchers have rarely measured enacted environments empirically.[7]

This study did so by merging two sets of secondary data. One was a patient-origin survey conducted by the state, which located by census tract each patient discharged from each hospital between June 1, 1976, and May 31, 1977. For every hospital, those data encompassed several thousand individual admission and referral choices of physicians and patients. When aggregated, they mapped the unique geographic market served by each organization. We then constructed demographic measures of these enacted environments from U.S. census data by calculating averages using the numbers of patients originating in different census tracts as weights. In this fashion, *urbanization* was measured in terms of average population density, *income growth* in terms of the average increase in median family income between 1960 and 1970, and *federal health insurance* in terms of the proportion of Medicare and Medicaid recipients. Our expectations concerning the environmental variable cluster were that *innovations would be more likely to be assimilated into organizations enacting environments that were urban and increasing in affluence and in which relatively few patients relied on federal health insurance.*

Organizational variables. A number of prior studies have reported that organizational size and structural complexity are related to the adoption of innovations (e.g., Rogers, 1983). We measured hospital *size* in terms of the number of patient beds, using a logarithmic transformation to adjust for curvilinearity (Kimberly, 1976). Following Meyer (1982), we measured *complexity* in terms of the availability of 24 distinct medical services. Since those services required either separate structural subunits or specialized staff members, the number available in a hospital reflects horizontal differentiation, the most common operational definition of complexity (Hall, 1987). Studies have also found that organizations' market strategies affect their

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[7] The enactment process is often misconstrued as limited to mental events or socially constructed realities. However, in a personal communication, Weick defined enactment as including concrete actions that confirm preconceptions. Thus, hospitals recruiting physicians or developing specialized programs in response to a perceived opportunity are enacting their environments.

TABLE 2
Independent Variables

Predictor Variables	Expected Relationships	Operational Definitions	Sources of Data
Environmental set			
Urbanization	+	Average population density within hospital service area (Baldridge & Burnham, 1975)	
Affluence	+	Average gain in median family income within hospital service area, 1960–70 (Baldridge & Burnham, 1975)	Patient origin survey (1977), U.S. Census data (1960, 1970)
Federal health insurance	−	Average proportion of Medicare/Medicaid recipients within hospital service area (Baldridge & Burnham, 1975)	
Organizational set			
Size	+	Log transformation of number of patient beds (Kimberly, 1976)	State rate review standards committee (1978)
Complexity	+	Availability of distinct medical services (Meyer, 1982; Moch & Morse, 1977)	
Market strategy	+	Aggressiveness in developing new services and penetrating new markets (Meyer, 1982)	Panel of local health care experts
Leadership set			
CEO tenure	+	Years of service (Kimberly & Evanisko, 1981)	Interview transcripts
CEO education	+	Years of education and degrees awarded (Kimberly & Evanisko, 1981)	Interview transcripts
Recency of staff's medical education	+	Median age of hospital's active medical staff (Greer, 1984)	American Medical Association
Innovation set			
Risk	−	Level of risk of injury, death, or malpractice liability (Meyer, 1985)	Expert panel of medical-college faculty members
Skill	−	Manual skill or specialized training requirements (Rosenthal, 1979)	
Observability	+	Impact of equipment on flows of patients (Meyer, 1985)	
Innovation-decision set			
Compatibility	+	Equipment's compatibility with pattern of medical staff specialization (Tornatzky & Klein, 1982)	Expert panel and rate review
CEO advocacy	+	Extent of CEO's support for adoption coupled with decision-making influence (Daft & Becker, 1978)	Content analysis of interview transcripts

proclivity to adopt innovations (Miles & Snow, 1978). Again following Meyer (1982), we measured *market strategy* by pooling the judgments of experts concerning the aggressiveness with which hospitals pursued new markets. With respect to the cluster of organizational variables, we expected that *innovations would be more likely to be assimilated into organizations that were large, complex, and eager to penetrate new markets.*

Leadership variables. Whether leaders' impacts on their organizations are primarily instrumental or symbolic is an unresolved issue (Pfeffer & Davis-Blake, 1986). However, both logic and some evidence (Hage & Dewar, 1973; Kimberly & Evanisko, 1981) suggest that those who allocate resources can influence adoptions of innovative equipment. Administrators and physicians share power in hospitals, and both are potential sponsors of innovations in medical technology (Greer, 1984). Among administrators, those with long tenures and graduate professional degrees are most likely to possess the budgetary acumen and the legitimacy needed to facilitate—or block—an adoption. Among physicians, those who received their medical training recently are most likely to have been exposed to state-of-the-art technology and to seek its adoption in their hospitals.

The tenure of the *chief executive officer* (CEO) was measured in years of service. Following Kimberly and Evanisko (1981) we measured the *CEO's educational level* using an index combining years of graduate and undergraduate education and degrees received. Among physicians, the *recency of medical education* was measured in terms of the median age of the members of each hospital's active medical staff. The expectations regarding this cluster of variables were that *innovations would be more likely to be assimilated into organizations whose chief executives had long tenures and high levels of education and whose physicians had been trained recently.*

Innovation variables. Innovations have certain inherent characteristics that influence their adoptability (Rogers & Shoemaker, 1971) and are relatively invariant across settings (Downs & Mohr, 1976; Tornatsky & Klein, 1982). For measuring characteristics like those, innovations are the appropriate units of analysis. One relatively invariant characteristic of particular pieces of medical equipment is the level of risk of injury or death to which they expose patients and the concomitant risk of malpractice litigation to which they expose physicians who use them (Meyer, 1985). A second characteristic likely to influence adoptability uniformly is the degree of manual skill or specialized medical training required to use an innovation (Rosenthal, 1979). A third characteristic is observability, the degree to which the results of using the innovation are visible to organizational members and external constituents (Rogers & Shoemaker, 1971).

Risk and *skill* were measured by pooling the judgments of a panel of medical college faculty members (see the Appendix for details). *Observability* was measured by reasoning that the visibility of medical equipment largely depends on its impact on patient flows. The basic issue then becomes who or what must be transported in order to use a piece of equipment: (1) patient specimens, (2) equipment within a hospital, (3) patients within a hospital, or (4) patients between hospitals. The expert panel used those four categories as an ordinal scale on which to classify the 12 innovations. The scale is grounded on the assumption that innovations are maximally observable if they affect patient admissions and transfers and minimally observable if they affect only flows of tissue specimens or blood samples. Our expectations regarding this cluster of variables were that *innovations would be more likely to be assimilated into organizations if, compared to other innovations, they required less skill to use, exposed patients and doctors to fewer risks, and were more observable.*

Innovation-decision variables. Certain factors affecting the assimilation of an innovation are unique to the evaluation of that particular innovation within that particular organization (Downs & Mohr, 1976). In such cases, the innovation decision becomes the appropriate unit of analysis. Two approaches are available for conducting an inquiry at this level: the direct approach is to measure variables by collecting data unique to each innovation within each organization; the indirect approach is to hypothesize a statistical interaction between two variables measured within more inclusive units of analysis than the innovation decision.

In this study, two innovation-decision variables were measured directly. An innovation's compatibility with the tasks and experiences of potential users has been the most widely investigated aspect of the fit between innovation and organization (Tornatzky & Klein, 1982). In the case of medical equipment, the primary criterion of compatibility is the presence on the medical staff of physicians practicing a specialty appropriate for using the equipment. A secondary criterion is the presence of physicians whose practices lead them to regularly treat patients who require referral to those user specialists. A tertiary criterion is the presence of physicians who refer patients only occasionally or who would enjoy other sorts of indirect benefits from the innovation. Accordingly, *compatibility* was measured for each innovation in each hospital by calculating an index reflecting the configuration of potential using physicians, referring physicians, and indirect beneficiaries (see the Appendix for details).

Another potentially important innovation-decision element is the extent to which an organization's CEO champions or opposes adoption (Beyer & Trice, 1978; Daft & Becker, 1978). In this study, we defined *CEO's advocacy* as influential support and measured it for each innovation by assessing the extent to which a CEO (1) personally supported acquisition and (2) exerted influence during decision-making processes. Our expectations regarding the directly measured innovation-decision variables were that *innovations would be more likely to be assimilated into organizations in which the innovations were compatible with patterns of medical specialization and whose CEOs were influential proponents.*

Two other innovation-decision variables were defined as statistical interactions between variables measured in more inclusive analytical units than we used for compatibility and CEO's advocacy. The first interaction term chosen for examination was *skill × recency of medical education.* We reasoned that the skill required to use an innovation would be a less important determinant of adoption in a hospital where medical training was relatively recent (Greer, 1986). The second interaction we examined was *observability* × *urbanization*. Theories about hospitals' responses to their institutional environments have maintained that organizations adopt innovations producing visible consequences for ceremonial reasons in addition to instrumental reasons (Meyer & Rowan, 1977). Research suggests that ceremonial adoptions are more prevalent in urban settings than in rural settings (Fennell, 1980), presumably because competition for patients, financial resources, and legitimacy is higher in urban settings.

Data Analysis

When a study's independent and dependent variables are conceptualized as pertaining to different units of analysis, the dependent variable determines the appropriate level of analysis (Freeman, 1978; Rousseau, 1985). This study's dependent variable was the assimilation of innovations into organizations. Because we conceptualized assimilation as the outcome of an unfolding series of organizational decisions, we conducted our analysis at the level of the innovation decision. In the model shown in Figure 1, assimilation is a multivariate function of the five sets of predictor variables discussed in the preceding sections. To measure those variables, we gathered data in different units of analysis, some of which were more inclusive than others. The result was a set of nested observations in which the research design restricts the variance of certain variables.[8] Table 3 presents the means, standard deviations, and intercorrelations of all variables included in the analyses.

The five sets of predictor variables were seen as differentiated in terms of causal priority: no variable in the organizational set appeared to be a likely cause of environmental characteristics, and no variable in the leadership set was a likely cause of either organizational or environmental characteristics. Similarly, innovation variables were not plausible causes of characteristics of leaders, organizations, or environments, and innovation-decision variables were not plausible causes of any other variable in the analyses. Simply stated, we assumed a weak causal ordering among the five sets of predictor variables.

However, our knowledge of the model's causal structure was incomplete. Although the environmental variable set, for instance, appeared to be causally prior to the organizational set, we could not specify the causal ordering of variables within either set, nor were we confident that unmeasured common causes were absent.

To capitalize on our partial understanding of the variables' causal structure, we chose hierarchical multiple regression as the method of data

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[8] For example, the compatibility of an innovation with an organization is free to assume a unique value for each of the 300 innovation decisions, but reading an ultrasound image requires the same level of skill in all 25 hospitals, and the size of a hospital remains the same no matter which of the 12 innovations is under consideration.

TABLE 3
Descriptive Statistics and Correlation Matrix for All Variables

Variables	Means	s.d.	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1. Innovation assimilation^{a}	5.67	2.86														
2. Urbanization^{b}	5,033.80	4,015.20	.23***													
3. Income growth^{b}	81.35	20.00	−.22***	−.85***												
4. Federal health insurance^{b}	2.21	1.07	.08	.67***	−.64***											
5. Size^{b}	263.20	0.59	.32***	.55***	−.55***	.04										
6. Complexity^{b}	20.44	7.11	.28***	.57***	−.50***	.11	.82***									
7. Market strategy^{b}	2.37	0.81	.23***	.59***	−.52***	.22***	.70***	.57***								
8. CEO tenure^{b}	7.88	4.80	−.07	.07	.19***	−.06	−.01	.02	−.06							
9. CEO education^{b}	2.52	0.45	.14**	.39***	−.32***	.02	.45***	.53***	.23***	−.11						
10. Recency of medical education^{b}	48.60	2.94	.01	−.07	.01	.20***	−.07	−.11	−.11	−.07	.10					
11. Risk^{c}	2.53	1.65	−.65***													
12. Skill^{c}	4.07	1.48	−.44***										.46***			
13. Observability^{c}	2.67	1.11	.35***										−.25***	−.59***		
14. Compatibility^{a}	65.25	44.16	.38***	.25***	−.18***	.19***	.08	.33	.23***	.04	.16**	−.06	−.47***	−.03	.05	
15. CEO advocacy^{a}	4.42	1.28	.51***	.12	−.15**	−.03	.21***	.19***	.17**	−.11	.09	.03	.03	−.31***	.19***	.19***

[a] N = 300, measured at the innovation-decision level.

[b] N = 25, measured at the organization level.

[c] N = 12, measured at the innovation level. Correlations between organization-level variables and innovation-level variables are meaningless since the sampling strategy constrained their covariance to zero—the riskiness of an innovation didn't vary across the 25 organizations, and the urbanization of a hospital's environment didn't vary across the 12 innovations.

** $p < .01$

*** $p < .001$

analysis for this study. This technique provides a unique partitioning of the variance associated with different sets of independent variables (Cohen & Cohen, 1983). It allows tests of explicit hypotheses about the variance attributable to certain variables after others assumed to be temporally or causally prior have been accounted for.

If the assumption of weak causal ordering is tenable, intercorrelations between variables belonging to different sets of predictors present no problems of interpretation. Multicollinearity within each set of predictors, however, does pose problems. Consequently, we conducted item analyses to determine the feasibility of combining highly intercorrelated predictors into scales. The environmental, organizational, and innovation predictor sets each proved amenable to additive scaling (Cronbach's α's for the resulting scales were .89, .87, and .70, respectively).[9] The leadership and innovation-decision predictor sets, on the other hand, did not display either inordinately high intercorrelations or sufficient additivity for scaling (α's were .14 and .20). Consequently, we kept these predictors as separate variables in subsequent analyses.

A regression model was hypothesized and independent variables were introduced in five blocks. Since we assumed the environmental variables to be causally prior to all others, we entered the environmental scale first. The organizational scale came next, followed by the leadership variables and the innovation scale. Since innovation-decision variables were assumed to affect no other variables in the model, they were entered last. Model I F-tests of significance (Cohen & Cohen, 1983) were used to assess the changes in R^2 resulting from the addition of each new set of predictors.

RESULTS

Table 4 presents the results of the hierarchical regression of innovation assimilation outcomes on predictor variables entered in five blocks. It shows the standardized regression coefficients (β), adjusted coefficients of determination (R^2), and squared semipartial correlations (ΔR^2) after the entry of each block. R was significantly different from zero after the entry of each block. After block five was entered, with all independent variables in the equation, $R = .77$, $F_{10,289} = 42.1$, $p < .001$.

Predicting Innovation Assimilation

The central objective of our analysis was to evaluate the notion that three factors determine the assimilation of technological innovations into

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[9] These three scales also satisfy the criterion of theoretical plausibility. The items that form the environmental scale indicate that urban settings tend to afford less munificent health-care resources and to achieve lower rates of growth in personal income than other settings; the organizational scale indicates that large hospitals display more complex structures and appear more eager to penetrate new markets than others; the innovation scale reflects the tendency of highly observable diagnostic innovations (such as ultrasonic imaging) to reduce risks without requiring many new skills for their utilization.

TABLE 4
Results of Hierarchical Regression of Innovation Assimilation[a] on the Independent Variables

Variables	β	Standard Errors	R^2	ΔR^2
Environmental scale[b]	.20**	.057	.04	.04**
Organizational scale[b]	.29**	.064	.10	.06**
Leadership variables[b]			.11	.01
CEO tenure	−.08	.056		
CEO education	.01	.065		
Recency of medical education	.11	.091		
Innovation scale[c]	−.61**	.042	.48	.37**
Innovation-decision variables[a]			.59	.11**
Compatibility	.15**	.041		
CEO advocacy	.28**	.041		
Skill × recency of medical education	.12**	.041		
Observability × urbanization	−.02	.040		

Final $R = .77$
$F_{10,289} = 42.1, p < .001$

[a] $N = 300$.
[b] $N = 25$.
[c] $N = 12$.
** $p < .01$

organizations: contextual attributes, innovation attributes, and attributes stemming from the interaction of innovations and contexts.

Context as a predictor of assimilation. The first proposition in our conceptual model asserted that environmental, organizational, and leadership variables would account for unique variance in the assimilation of innovations. That assumption could be evaluated by determining whether and how much each set of contextual variables added to the regression model's ability to predict organizational assimilation. In block one of the hierarchical regression, the environmental scale afforded statistically significant, albeit modest, predictions ($\Delta R^2 = .04$). In block two, the addition of the organizational scale led to another significant but minimal increment ($\Delta R^2 = .10$). In block three, introducing attributes of leaders yielded no significant increment in predictive power.

Obviously, the contextual factors examined here predict innovation poorly; taken together, they account for only about 11 percent of the observed variance in assimilation. Nevertheless, the direction of the relationships indicated by the beta coefficients in Table 4 is generally consistent with our expectations—innovations were somewhat more prone to being assimilated into hospitals (1) serving urban environments and (2) exhibiting relatively large size, complex structure, and aggressive market strategies.

Innovation attributes as predictors of assimilation. The second proposition maintained that innate attributes of innovations would account for unique variance in their assimilation. This assertion could be evaluated by determining how much the scaled innovation variables added to the model's ability to predict organizational assimilation.

When the innovation scale was introduced into the regression model in block four, a marked improvement in prediction occurred ($\Delta R^2 = .37$). Apparently, medical innovations do possess innate attributes that significantly affect their adoptability—even after the effects of environmental, organizational, and leadership variables have been statistically eliminated. The zero-order correlations suggest that among the medical innovations examined here, those that were highly observable, carried low risks, and required relatively little skill to use were more readily assimilated than were other innovations.

Innovation-decision predictors of assimilation. The third proposition maintained that characteristics arising from the interaction of innovations and contexts would account for unique variance in assimilation. In block five, when the four innovation-decision variables were added to the model, another significant improvement in prediction occurred ($\Delta R^2 = .12$). This result suggests that in addition to their main effects, innovation variables and contextual variables interact to influence the assimilation of innovations.

The beta coefficients in Table 4 imply that an innovation is particularly likely to be assimilated if it is championed by a CEO who exerts substantial influence on its behalf. Compatibility with existing patterns of medical specialization also seems to facilitate assimilation—the greater the number of potential beneficiaries of a particular innovation, the more likely the hospital is to adopt and implement it. The results also suggest that skill and recency of medical education interact as anticipated; the amount of skill needed to use an innovation exerts a greater effect on its assimilation into a hospital the more years have elapsed since the typical physician completed his or her training. On the other hand, the expected interaction between observability and urbanization failed to materialize.

Overall, the results of the regression analyses offer reasonable support for the conceptual model and methodological approach proposed here. As we hoped, innovation assimilation appears to be a tractable dependent variable, and as we proposed it appears that innovation attributes, contextual attributes, and innovation-context interactions codetermine assimilation.

DISCUSSION

This study departed from a tradition of conceptualizing innovation within formal organizations as a systemic property and measuring it in terms of an aggregate innovativeness score. Instead, we conceptualized the dependent variable as the assimilation of innovations, characterized assimilation as a nine-step decision process, and measured assimilation by going to the field to track adoption proposals through organizations. We advanced a model suggesting that three classes of antecedents—contextual attributes, innovation attributes, and attributes arising from the interaction of innovations and contexts—determine the assimilation of technological innovations into organizations. We measured antecedents by gathering data from multiple sources using multiple methods and used those data to predict the outcomes of 300 innovation-assimilation processes in hospitals.

Two principal conclusions can be drawn from the results. One is that the proposed model affords reasonably good predictions of the extent to which a given hospital will assimilate a given innovation: 59 percent of the variance in evaluation, adoption, and implementation was explained. Second, the findings suggest that an organization's assimilation of a new technology is highly dependent upon attributes of the particular innovation in which it is embodied and upon attributes of the particular decision process in which it is aired. Organizational leaders, structures, and market environments appear to exert considerably less influence, at least in terms of their main effects. Our results do suggest, however, that these antecedents may influence assimilation by interacting with innovation attributes.

Before the implications of these findings are discussed, several caveats are in order. First, regarding the relative primacy of different classes of predictor variables, the results of our analyses are far from definitive. Some sets of predictors may have included more of the population of relevant variables than others, and variance was restricted for those variables not measured specifically for each innovation decision. Second, our results may lack generalizability. It is obvious that conclusions drawn from studying hospitals' adoptions of medical technology should be extrapolated cautiously to other organizations adopting other kinds of innovations. Moreover, although the innovation-decision research design used in this study appears to have facilitated prediction by capturing contextual idiosyncrasies, we may have gained accuracy at the expense of generalizability. In pursuit of internal validity, our approach has probably sacrificed external validity.

Nevertheless, this study's results may have implications for theory and research on organizational innovation. Attributes of innovations accounted for nearly 40 percent of the variance we observed in their assimilation. Previous comparative studies of innovation adoption in organizational settings have invoked innovation attributes categorically in establishing boundaries for midrange theorizing. For instance, researchers have drawn theoretical distinctions between routine and radical innovations (Dewar & Dutton, 1987), administrative and technical innovations (Kimberly & Evanisko, 1981), and product and process innovations (Pelz & Munson, 1982). However, those studies have not used innovation attributes as predictor variables. Thus, although the results presented here are not directly comparable with those of prior research, they do suggest that including innovation attributes in future studies of adoption and implementation may have considerable merit.

Organizational variables, on the other hand, accounted for considerably less variance in our study than earlier research had led us to anticipate. For instance, in an investigation of hospitals' adoption of medical innovations and computerized information systems, Kimberly and Evanisko measured many of the same predictor variables used in this study but concluded that "organization-level variables—size in particular—are *indisputably* better predictors of both types of innovation than either individual or contextual level variables" (1981: 709). (Their "individual" and "contextual level" predictors correspond to our "leadership" and "environmental" predictors.) But since Kimberly and Evanisko used organizational innovativeness as the dependent variable, the two sets of results lack comparability.

To enable a comparison, we recoded our set of 300 assimilation scores as adoptions or nonadoptions and aggregated these nominal data to the organizational level. This process yielded a single innovativeness score for each hospital. Next, we used the same predictor data to replicate, at the organization level, our analysis at the innovation-decision level. Table 5 presents the results of a hierarchical regression of the 25 hospitals' organizational innovativeness scores on the environmental, organizational, and leadership predictors. We omitted attributes of innovations and innovation decisions because the former take constant values when aggregated and the latter lose theoretical meaning. The regression model explains 74 percent of the variance in organizational innovativeness, with the largest contribution coming from the scale combining organizational size, complexity, and strategy.

The findings summarized in Table 5 closely resemble those of Kimberly and Evanisko (1981). In both analyses, organization-level variables afforded the best predictions of innovativeness, environmental variables explained about half as much variance as the organization-level variables, and leadership variables proved to have less explanatory power than the other sets. Such results are interesting and worth knowing; there are theoretical gains and practical advantages inherent in understanding which organizations are

TABLE 5
Results of Hierarchical Regression of Organizational Innovativeness[a] on the Independent Variables

Variables	β	Standard Errors	R^2	ΔR^2
Environmental scale	.44*	.187	.20	.20*
Organizational scale	.76**	.153	.62	.42**
Leadership variables			.74	.12
CEO tenure	−.24	.120		
CEO education	.14	.132		
Recency of medical education	.35	.180		

Final $R = .86$
$F_{5,19} = 10.7, p < .001$

[a] N = 25.
* p < .05
** p < .01

liable to adopt a high proportion of the technological innovations they encounter. But although organizational attributes like size and complexity may characterize generally innovative organizations, they need not lead to the adoption of discrete innovations. Research designs that take the organization as the unit of analysis are inappropriate if an investigator wishes to predict or explain the adoption of a *particular* innovation.

Consider how sharply the innovativeness results in Table 5 differ from the innovation-decision results in Table 4 even though the two analyses use the same data. This comparison underscores the consequences of unrecognized shifts in levels of analysis, and it suggests why certain variables thought to be theoretically relevant to innovation have displayed little explanatory power in earlier investigations (Downs & Mohr, 1976).

Innovation, like so many other constructs in organization theory, appears not only to assume different meanings at the individual and organizational levels of analysis but also to arise from different causal functions at different levels. It is probably a mistake to expect broad-scope examinations of organizational innovativeness to add much to our understanding of the adoption of innovations. It is probably equally mistaken to expect fine-grained studies of innovation assimilation to yield many new insights into organizational effectiveness and adaptability. Levels of analysis and domains of explanation are inextricably linked.

The results reported here may also have practical implications. Most prior studies of organizational innovativeness have found that leaders' characteristics afford poor predictions (Tornatzky et al., 1983), and they have reported few significant relationships involving variables that managers could reasonably be expected to manipulate. Consequently, many innovation researchers have joined Lieberson and O'Connor (1972) and Pfeffer (1981) in concluding that leaders have a limited impact on organizational actions.

Our findings present leaders in a more favorable light. They suggest, for instance, that although CEOs' demographic characteristics may not determine aggregate rates of adoption by their organizations, CEOs nonetheless can have substantial impact by championing the assimilation of specific innovations. Similarly, although the specialized expertise of professional organization members may exert no uniform effect on innovation adoption, in conjunction with the potential benefits or the skills required to use particular equipment, specialized expertise can become an important determinant of adoption and utilization.

In comparison to other operational definitions, measuring innovation in terms of organizational evaluation, acquisition, and utilization decisions comes closer to capturing the ebb and flow of events that people actually try to influence as members of their organizations. It may also come closer to capturing the construct that we actually want to explain as students of organizing. Moreover, aproaching innovation as an assimilation process may allow researchers to identify those occasions when innovations are adopted for ceremonial reasons. Like members of academic organizations plying sophisticated mathematical analyses to achieve publication, members of other organizations sport technological innovations to garner legitimacy in their own, institutional environments (Meyer & Rowan, 1977).

For instance, state regulators' fears that health-care costs would rise owing to unnecessary purchases of computerized axial tomography (CT) scanners by the 25 hospitals we studied became a self-fulfilling prophecy. When the regulators decreed that only 6 hospitals would be authorized to purchase scanners, the edict transformed a risky investment into the quintessential symbol of a modern, technologically progressive hospital. Organizational decision makers increased revenue projections, opponents of adoption were converted into sponsors, and within four years, 14 of the 25 hospitals had purchased scanners. The potent ceremonial meanings ascribed to this equipment were evident when, in appealing a rejected request to purchase it, the city fathers of one municipality solemnly testified that a campaign to recruit industry to their community had been crippled by the absence of a scanner in the local hospital.

The city fathers won their appeal and got their CT—and a new factory moved to town. If their causal model was accurate, a ceremonial adoption (Meyer, 1984) undertaken to satisfy mythical expectations of an institutional environment (Meyer & Rowan, 1977) ultimately enacted an organization's objective environment (Weick, 1979). If the city fathers were correct, the assimilation of technological innovations into organizations may be considerably more complicated than organizational scholars have imagined.

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the technical systems contain a definable probability of failure. As a result, accidents are to be expected. They are normal. In Perrow's terms, Three Mile Island was a "normal accident" demonstrating the limited capability of humans acting alone or through their administrative apparatus to control the light-water-reactor technology.[2]

One key finding of Rogovin's (1980) and Kemmeny's (1979) reports of the Three Mile Island accident was that even though nuclear and fossil fuel plants were similar once steam was generated, operating a nuclear plant was quite different from operating a fossil fuel plant. Those analysts considered the nuclear generating technology more than just another way to boil water. For instance, leaking valves, casual on-the-job training, extensive maintenance backlogs, and vaguely written operating instructions are common conditions in fossil fuel plants but potentially serious safety problems in nuclear facilities. Nuclear operations may constitute what Tushman and Anderson (1986) called a "competence-destroying" technical change for utilities. Competence-destroying technologies "require new skills, abilities, and knowledge" (Tushman & Anderson, 1986: 442). Nuclear facilities required new procedures and administrative arrangements that emphasized a level of quality (U.S. Nuclear Regulatory Commission, 1982) and freedom from error in operations (La Porte, 1982) that fossil fuel plants did not require. Thus, previously developed competencies and rules of thumb perhaps no longer applied.

With such a dramatic change in technology, major changes in the management of utilities might have been expected (cf. Tushman & Anderson, 1986). Reports filed with the NRC suggest, however, that U.S. utilities with nuclear plants have instituted few changes in the organizational structures and patterns of executive succession common in the prenuclear era (Olson et al., 1984). Nuclear utilities are still quite centralized, rigid machine bureaucracies (Mintzberg, 1979). For instance, functional structures dating to the era of fossil-fuel and hydroelectric technologies are still dominant. In the early 1980s, very few senior executives in nuclear utilities had experience with operating nuclear plants, listed nuclear engineering as their original technical specialty, or had extensive management experience in more than one utility (Osborn et al., 1983).

COMMITMENT TO AND INVESTMENT IN NUCLEAR POWER

Although most nuclear utilities share similar traditions, they are far from identical. Several accounts have suggested that utilities that are highly committed to nuclear technology may be more willing and able to safely manage their nuclear plants than are less committed utilities (Cook, 1985; Office of Technology Assessment, 1984; Taylor, 1987). Few of those accounts have specifically identified the major components of "commitment," but the utilities cited as more committed are generally those with a large financial investment in nuclear technology and a large staff involved in dealing with it. Essentially, utilities with high investments are described as more committed because they allocate more resources toward safely managing their plants than other utilities do.

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[2] Elster (1983) expressed similar concerns, noting that the inherent uncertainty of the probability of failure and the magnitude of the consequences make nuclear power socially untenable.

Preliminary data from a series of NRC studies did begin to link commitment and safety through specific organizational capabilities. Utilities' administrative capabilities were found to be associated with a number of safety-related criteria (Marcus & Osborn, 1983; Olson et al., 1984; Osborn et al., 1983). In general, plants with more elaborate and sophisticated administrations—with, for instance, many coordinative mechanisms between functional departments—were found to have fewer potential safety problems. However, some anomalies appeared. For instance, more levels of administration, greater centralization, and more employees were associated with more potential problems.

Unfortunately, after the initial outcry following the Three Mile Island accident subsided, the NRC cancelled further studies and replaced them with audits conducted under the auspices of the industry-financed Institute of Nuclear Power Operations (1984). Some of that organization's audits are publicly available—but only after results have been cleared by the audited utilities. Some censored reports released to the public have suggested that utilities with comparatively small investments in nuclear power rely heavily on outside contractors for key safety services, and the performance of such contractors appears to vary considerably (Institute of Nuclear Power Operations, 1985).

Several analyses have also identified a qualitative component of commitment. Commitment has been linked to the willingness of a utility to initiate new safety programs, study safety issues, or develop new employee-training programs (Clark, 1984; Office of Technical Assessment, 1984). It is also apparent that initiating such discretionary programs is expensive and that the expense comes on top of many new post–Three Mile Island requirements. After that accident, the NRC called for new, more expensive and sophisticated operator training programs and new engineering support groups. The NRC challenged the industry to defend the quality and number of support staff, operating crews, and managers assigned to new facilities (Osborn et al., 1983; U.S. Nuclear Regulatory Commission, 1982a). Some utilities had difficulty financing those upgrades since earnings growth had been severely constrained in the late 1970s and early 1980s.

Popular press accounts have often equated good financial and safety performance with good management (Taylor, 1987). Cook's (1985) analysis explicitly linked commitment and prior earnings, suggesting that operating a safe plant and having a record of earnings growth both reflected sound management. It is also possible that utilities with a history of earnings growth operate in munificent environments where, for instance, state regulatory bodies have been willing to grant rate increases. Extending the work of Staw and Szwajkowski (1975), we speculated that firms operating in munificent settings may be less likely than others to violate legal stipulations such as NRC safety requirements.

Although utilities as a group may not be historically suited to manage nuclear technology, those with more invested in the technology may have a greater capacity to manage their plants safely than utilities with less invested. Some analysts claim that more committed utilities—those with the highest investments—are simply more capable. Others link commitment, management expertise, and plant safety, suggesting that both financial capacity and good management may be partially reflected in a utility's record of earnings growth. Thus,

> *Hypothesis 1: Utilities with a relatively greater investment in nuclear technology should have higher reliability and fewer safety violations than utilities with lower investments.*
>
> *Hypothesis 2: Utilities with a record of relatively higher earnings growth should operate more reliable plants with fewer violations than utilities with lower rates of earnings growth.*

COMMITMENT: AGENCY AND PROSPECT THEORY

If nuclear utilities are not committed to safety in operating their plants, it is only logical to ask what other commitments might be more important to them. As Del Sesto (1983) noted, several early critics were concerned that utility executives would be more interested in corporate earnings than in public health and welfare. Advocates of agency theory have suggested that executives may place their self-interests above the interest of others (Hechter, 1984; Olson, 1965).

Industry representatives have always been quite clear in responding to the charge that they might trade earnings for safety. Recently, McCracken (1984) outlined their argument. Essentially, the economic interests of utilities are to link earnings and safety. Utilities can gain additional earnings with relatively more reliable plants and a reliable plant is often considered a safe one. As "base load" facilities, nuclear plants are expected to operate during both peak and slack demand periods. If they are not operating, electricity from expensive peaking plants or power purchased from other utilities must replace the electricity they could supply. Replacement power for a large nuclear facility can easily cost over half a million dollars a day. Rarely can additional power-generating costs be wholly transferred to rate payers. If, on the other hand, plant reliability exceeds expectations, utilities may be able to keep a portion of the additional revenues generated. In addition to those economic incentives for high plant reliability, executives point to the dire financial consequences of an accident (Clark, 1984). Some have also suggested that another major accident in a U.S. reactor could lead to closure of all U.S. nuclear power plants (McCracken, 1984).[3]

However, there may be trade-offs between earnings and safety if safety is defined in terms of defense-in-depth. Administrative and personnel investments associated with defense-in-depth are typically considered costs and may not be a part of a utility's rate base for calculating an acceptable rate of return.

Efforts to improve reliability could spill over into improvements in meeting defense-in-depth if safety-related criteria were highly intercorrelated. However, prior work analyzing the relationships among safety-related criteria suggest that different measures of safety are not strongly correlated. For instance, Olson, Osborn, Jackson, and Skikiar (1986) reported that the number of plant safety problems reported by utilities (licensee event reports) were not associated with other safety-related criteria such as the number of times plants automatically shut down. Other analyses of safety-related criteria suggest much the same (see Osborn et al., 1983, for a review).

An Agency Perspective on Safety and Investment

If various safety-related criteria are not highly correlated and not clearly linked to a utility's economic interests, nuclear plant safety rests, in part, on the noneconomic interests of utility executives. They may allocate more or fewer resources to safety than an economic analysis might suggest. Some executives clearly have initiated safety programs not specifically mandated by federal regulations or necessarily designed to improve reliability (Institute of Nuclear Power Operations, 1985). Some of those programs are directed toward reducing the chances of an accident by improving defense-in-depth. Conversely, some analysts have suggested that additions to defense-in-depth may be excessive "gold plating" (McCracken, 1984).

Variations in willingness to take safety risks is particularly important since our analysis of the literature on industry safety suggested an emphasis on preventing events with incredibly small chances of occurrence. Safety studies presume utility executives should be risk averse. However, even casual inspection of the industry suggests that some utilities have so heavily committed themselves to nuclear power that they are risking their future on this technology. Other utilities have developed a diversified portfolio of energy-generating technologies. We suggest that the proportion of a utility's investment in nuclear power partially reflects the technological risk preferences of its senior executives. Those with heavy investments may be technological risk takers. Executives in utilities with extensive commitments to nuclear power purport to be technological innovators who are ahead of their less committed counterparts (Office of Technology Assessment, 1984: 2–12).

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[3] However, we should also point out that the financial consequences of an accident to a utility are limited (Del Sesto, 1983) and that the variety of plants might well allow many to escape a general closure by simply claiming that their facilities do not have the defects of the one suffering the accident.

They also appear willing to challenge conventional solutions to some safety issues (Marcus & Osborn, 1983).

For such an interpretation of investment to be meaningful for predicting current plant-safety performance, current executive constellations must hold the same technological risk preferences as those who originally committed their institutions to nuclear power. That argument seems plausible. As noted above, U.S. utilities with nuclear plants are generally very old centralized bureaucracies characterized by internal succession. The preferences of prestigious, powerful, and well-respected senior executives could well set the tone for aspiring managers (Daft & Weick, 1984). Since succession to senior ranks often follows a long period of socialization and careful selection, a particular bias toward nuclear power could easily be transferred across several generations of executives (Osborn et al., 1983). Finally, attitudes within a utility may solidify under years of constant external threat by antinuclear groups (Ford, 1984). Thus, the senior executive group within a utility could share a technological risk preference with their predecessors.

Prospect Theory and Nonlinear Responses Under Conditions of Gain and Loss

Several analyses of risk preferences have suggested that responses by risk-taking or risk-averse decision makers are not linear over all types of bets (Raiffa, 1971). Further, ample laboratory evidence and analyses of organizational decisions have suggested that under conditions of growing losses, the revealed preference of presumedly conservative decision makers is to take greater risks (Bazerman, 1984; Kahneman & Tversky, 1979, 1982; Slovic & Lichtenstein, 1983).

Considerable controversy has surrounded the interpretation of this line of research (Jackson, 1987). Part of the controversy concerns conditions constituting a loss. Preference reversal might not occur in the power industry because all utilities have positive earnings and a positive decision frame. On the other hand, decision makers probably view corporate financial performance in relative terms (Osborn, Hunt, & Jauch, 1980). Since the middle seventies, all utilities have faced a number of crises, including the oil embargo, inflation, and rate restraint, but some have been able to maintain their earnings growth and others have not. Some have been comparative winners and others, losers, as Cook (1985) also suggested.

There has also been considerable controversy over whether decision makers can be considered risk seeking or risk averse (Jackson, 1987). Our reading of prospect theory suggested that popular interpretations have limited that theory to presumedly risk-averse individuals predominantly operating in the domain of losses (Bazerman, 1984). To formulate an analysis of presumedly risk-taking utility executive constellations operating under conditions of both gains and losses, we turned to another body of literature. We reviewed studies of opportunistic actors whom researchers have termed riverboat gamblers, speculators, entrepreneurs, and free riders (Hey, 1979; Hibdon, 1969; Jackson, 1987; Knight, 1921). This literature indicated that decision makers take gambles under conditions of gain—and not only when they are facing losses. For instance, a flush riverboat gambler will exploit a rube.

Executives in nuclear utilities are not just playing against nature but also against federal and state regulators who are respectively concerned with safety and rates. It is reasonable to expect that executives' prior success will affect their current and future actions. Thus, we expected utilities with heavy nuclear investments to take risks in violating NRC stipulations under conditons of gain, just as flush riverboat gamblers are expected to exploit relatively less informed and skillful players. However, just as losing riverboat gamblers still pay their dues to the house, executives with substantial nuclear investments will probably comply with regulations when they have a history of financial losses.

We thus extended prospect theory to predict that a framing bias will operate for risk takers as well as for risk avoiders. For utilities that are heavily invested in nuclear technology and have good financial performance and for utilities that have diversified their energy-generating portfolios and have poor financial performance, the number of violations reported by the NRC should be comparatively high. Put in more colorful language, riverboat gamblers will exploit the rube, and risk-averse utilities will attempt to recoup losses. Conversely, violations should be comparatively low (1) when a utility heavily committed to nuclear power has poor financial performance and (2) when a fairly successful nuclear utility holds a diversified portfolio of energy-generating technologies. Overall, our extension of prospect theory yielded the expectation of a curvilinear interaction effect between a utility's prior financial performance and its investment in nuclear power in predicting the number of plant safety violations reported by the NRC. We expected increasing departure from a linear interaction toward the extremes. More formally stated,

> *Hypothesis 3: The frequency of safety violations in U.S. nuclear power plants will be a nonlinear interactive function of earnings growth and investment in nuclear technology.*

METHODS

The NRC licenses each reactor-turbine combination belonging to a particular utility separately and issues notices of violations by plant. For the current analysis, we decided to use reported violations and reliability as the base for determining the unit of analysis. Therefore, where a utility operated more than one reactor-turbine, we assigned all its plants the same score for commitment and prior earnings. Such an assignment process is common in the analysis of nuclear plants and appropriate for an attempt to estimate the linkage between utility conditions and plant safety (Osborn et al., 1983). The process is also consistent with Feinberg's (1981) recommendations concerning investigations that cross units of analyses.

Technical Controversies

U.S. nuclear power plants include a wide range of sizes and types of reactors that represent different trade-offs among thermal efficiency, responsiveness to load requirements, economies of scale, system redundancy, and other factors (Nero, 1979). Not surprisingly, technical disputes abound within the industry (Osborn et al., 1983). Some claim that plant size and age are important factors for safety. Older designs often have smaller nuclear reactors and often contain fewer redundant safety systems than recently built plants. However, utilities have more experience with the older types of plants. Facilities with newer designs are larger and often contain more sophisticated safety systems than the older ones. However, the new designs may have less well-proven equipment and may be run by operators with little on-line experience (Potash, 1983).

Throughout the history of the U.S. light-water-reactor program, controversies have continued over the safety of different basic designs (Taylor, 1987). Some analysts consider boiling water reactors safer because they have comparatively low operating pressures, among other factors. However, critics have often been concerned that, since steam passes directly from the reactor core to the turbines, an accident in a boiling water plant might yield a substantial release of radioactive material (Olson, McLaughlin, Osborn, & Jackson, 1984). Conversely, others consider pressurized water reactors safer because, among other factors, the steam generated by the nuclear reaction is contained in a closed loop (Nero, 1979). Heat is transferred to a second loop via steam generators. Critics of these systems have been concerned with the high pressures needed to maintain acceptable thermal efficiency. For instance, leaks can develop in the steam generators linking the contaminated and noncontaminated loops.

Finally, various industry reports, comments in the popular press, and interviews we have conducted have suggested that NRC regulatory scrutiny and construction practices may well vary by region, producing regional variations in safety (Olson et al., 1984). Thus, in addition to plant size, type, and age, region should be included in the examination of plant operating safety.

TECHNOLOGY AND ORGANIZATIONAL FIT CONTROVERSIES

Since 1979, investigators concerned with the nuclear power industry have challenged the almost exclusive emphasis on technical factors as causes of accidents and determinants of safety. Some critics have suggested that the utilities managing nuclear technology pose a safety threat (Kemmeny, 1979; Osborn et al., 1983; Perrow, 1984; Rogovin, 1980). Perrow, a leading critic of the industry, focused on the limited administrative capability of organizations to control complex dangerous technologies. He argued that design-in-depth, with its redundancy and automatic safety systems yields an enormously complex, tightly coupled technical system. He further suggested that current administrative systems, designed and implemented by human beings, are incapable of controlling such tightly coupled technical systems. Moreover, and unrecognized deficiencies in the design or operation of operating facilities. For instance, considerable work has been done on identifying possible scenerios leading to a loss of coolant to the reactor core which could yield difficulties in controlling the nuclear reaction and possibly lead to radiological releases (Minarack & Kukielka, 1982).

Del Sesto (1983) suggested that safety studies from the 1940s to the late 1970s reflected a unique worldview in which large institutions are expected to effectively operate complex, dangerous technologies for their own benefit and that of society. With this worldview, safety improvements are made incrementally by focusing on specific technical components under the implicit assumption that the overall strategy for deployment of the technology was sound. Our review of the nuclear safety literature is consistent with this position (Jackson, 1987; Osborn et al., 1983). Few if any studies before 1979 identified possible safety risks stemming from the organizations used to deploy the technology (U.S. Nuclear Regulatory Commission, 1982a). Much of the literature concentrates on the design and performance of specific safety systems, pieces of equipment, and components under normal operating conditions and under specific accident scenarios (e.g., Vessely & Davis, 1985). Many published studies have focused on controlling the nuclear reaction — also known as controlling criticality—and preventing a release of radiation to the environment.[1]

One important line of safety research links reliability to controlling criticality and preventing radiological releases. Analysts have presumed that with functional and reliable systems, equipment, and components, there will be few challenges to safety systems that might lead to releases. With perfect reliability, operators should have sustained control of nuclear reactions (Mindrak & Kukielka, 1982). If safety is equated to reliability, the analyses of Vessley and Davis (1985), among others, have suggested that the proximate causes of unsafe operations have typically been limited to design flaws, equipment failure, inappropriate construction, poor maintenance, and human error. Previous research has sometimes labeled such proximate causes safety-related criteria (Olson & Osborn, 1986).

A complementary approach emphasizes the degree to which a utility maintains a plant's "defense-in-depth" (Nero, 1979: 225–251). The Nuclear Regulatory Commission (NRC) licenses U.S. plants and monitors the degree to which they maintain a host of primary, secondary, and tertiary safety systems designed to control criticality and contain radiation (U.S. Nuclear Regulatory Commission, 1982). Deviations from predetermined technical specifications are considered violations and signal a plant that is potentially less safe than if specifications were followed (Ford, 1984).

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[1] We, like most others concerned with nuclear safety, recognize that no single measure or concept of safety has emerged. Further, there are a number of potentially important safety issues not addressed here, including earthquake hazards, terrorist attacks, fuel recycling, waste disposal, design flaws, shoddy construction, and operator selection and training.

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LEADERS, RIVERBOAT GAMBLERS, OR PURPOSEFUL UNINTENDED CONSEQUENCES IN THE MANAGEMENT OF COMPLEX, DANGEROUS TECHNOLOGIES

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Utilities' investment in nuclear-generating technology and prior earnings growth were used to predict variations in three measures of plant-operating safety. The pattern of results is consistent with three interpretations: (1) some historically successful utilities that are heavily committed to nuclear power provide leadership; (2) such utilities are gambling with public safety; and (3) a general pattern of purposeful unintended consequences arising from ignorance and self-serving myths combined with the risk propensities of executives and leading to hitherto unidentified threats to public safety.

After the occurrence of major accidents at Three Mile Island, Bhopal, and, most recently, Chernobyl, organizational scientists have begun to analyze systematically the role of organizational factors in the management of complex, dangerous technologies. This study focused on the operating safety of nuclear power plants. We developed several propositions relating safety and organizational conditions from a review of the literature on nuclear safety and compared those propositions with expectations drawn from extensions of agency theory and prospect theory. The empirical portion of the analysis examines how well a utility's investment in nuclear technology and its prior earnings growth predict three measures of operating plant safety. The implications section blends the results with information gained in over five years of studying this industry to develop three possible interpretations.

SAFETY IN THE NUCLEAR INDUSTRY

Technical Aspects of Nuclear Safety

Much like the space, munitions, and chemical industries, the nuclear power industry follows the philosophy of "defense-in-depth," with multiple backups for important technical systems. Human intervention is to be minimized, and many safety systems are automatically triggered if key equipment malfunctions. Since nuclear accidents are rare but potentially catastrophic, many safety studies attempt to identify possible accident scenerios the CEO's influence on the process and constituted a measure of attributed power that is likely to have more validity than self-reports concerning power (Pfeffer, 1981). Power was measured as follows: (1) interview segments describing relevant decision processes were retrieved; (2) a rater counted the number of references made by all informants to the CEO, either by name or by position; (3) to control for variations in informants' verbosity, the number of references was divided by a description's total length in words; (4) the resulting values were trichotomized into high, medium, and low.

Finally, measures of the CEO's position on adoption and power during decision making were combined to yield an advocacy score on the following 7-point scale:

Position	Opposes			Neutral	Supports		
Power	H	M	L	H, M, or L	L	M	H
Advocacy score	1	2	3	4	5	6	7

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tic radiographic and computer techniques generating cross-sectional images of the body; *coronary artery bypass facilities*, equipment supporting saphenous vein autografts to bypass obstructed coronary arteries; *coronary precutaneous transluminal angioplasty*, treatment for coronary artery disease via dilation of a balloon within the artery to reduce circulatory obstructions; *electronic fetal monitoring*, continuous monitoring of levels of fetal stress; *fiberoptic endoscopy*, flexible scope for visualizing stomach, esophagus, colon, etc.; *laser surgery*, microsurgical equipment using laser beams in optical and gastrointestinal applications; *neonatal intensive care*, specialized monitoring and respiratory equipment housed in a nursery for premature infants; *phacoemulsification*, cataract removal procedure using ultrasonic vibrations to fragment the diseased lens; *radioimmunoassay*, diagnostic equipment for measuring antigen-antibody interaction in body fluids; *radionuclide scanning*, diagnostic imaging of gamma-ray emissions of radioactive labeled tumor-seeking agents; and *ultrasonic imaging*, pulsed sound waves used to map cross-sectional body topography on the basis of variance in acoustical impedance.

Assimilation of Innovations

The extent of each organization's assimilation of each innovation was determined as follows: (1) interview transcripts were divided into logical segments, attached to McBee sorter cards, and coded for retrieval; (2) all references made by all interviewees to a given innovation in a given hospital were retrieved using a needle-sort procedure and arranged chronologically according to the date of the interview; (2) two raters independently assessed the highest score achieved on the adoption scale; (3) discrepancies were eliminated by reanalyzing interview data and when necessary, recontacting interviewees; (4) scores between 7 and 9 on the scale were verified by consulting the state's annual survey of services available in hospitals, Certificate of Need applications, and other secondary data sources.

Organizational Attributes

Eight industry experts rated the hospitals' market strategy on a 4-point scale anchored as follows: This organization (1) seeks to dominate secure niches in stable health-care markets; (2) prefers to serve traditional markets, but may add services to remain viable; (3) attempts to incorporate innovative programs while preserving a firm base of traditional services; (4) seeks to pioneer in developing innovative services and programs. The experts rated market behavior displayed during 1978. Their ratings had an interclass correlation of .89.

Innovation Attributes

Seven medical college faculty members used 7-point scales to rate the innovations in terms of risk, defined as the degree to which the medical profession accepted the equipment as safe and efficacious in 1978, and skill, the extent of specialized expertise or training needed for a typical specialist to begin using the equipment in 1978. Interclass correlations for risk and skill were .76 and .95, respectively.

Innovation-Decision Attributes

Compatibility scores (C) were calculated for each innovation in each hospital as follows: $C = 3U + 2R + B$, where U = the number of physicians serving on a hospital's active medical staff in 1976 practicing in a medical specialty that utilized that equipment directly, R = the number whose practices regularly generated referrals of patients to utilizing specialties, and B = the number making infrequent referrals or otherwise benefiting indirectly from acquisition of the equipment.

CEO advocacy was measured by constructing an index combining a CEO's personal position concerning an innovation (support, opposition, or neutrality) and the amount of power that he or she exercised during decision making (high, medium, or low).

The CEO's support was determined as follows: (1) using the McBee sorter cards, all relevant interview segments were retrieved using a needle-sort procedure; (2) two raters independently classified these segments as displaying opposition, neutrality, or support by the CEO; (3) 14 disagreements between raters were resolved through discussion, and 7 were resolved by recontacting informants.

The CEO's power was assessed in terms of the rate at which participants alluded spontaneously to the CEO while reporting a decision process. We reasoned that such allusions indexed

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APPENDIX

Medical Innovations

In 1977, a five-member panel of medical college faculty members identified a list of innovations from which the following 12 were chosen for study: *automated batch analyzer*, computer-assisted automatic chemical analysis of blood serum; *computerized axial tomography*, diagnos-

Measures of Operating Safety

From 1975 to 1981, some 42 commercial reactors operated in 26 utilities continuously holding NRC operating licenses. Data from public sources were available for 41 of these 42 plants (U.S. Nuclear Regulatory Commission, 1982). Our historical analysis of safety in the industry suggested two measures of operating safety that could be directly linked to controlling criticality and containing radiation: plant reliability and violations.

Plant reliability. Using information on total hours of operation (U.S. Nuclear Regulatory Commission, 1982), we adjusted raw data for 1981 to eliminate hours of nonoperation due to outages for such reasons as scheduled maintenance, refueling, and retrofitting (see Osborn et al., 1983, for the exact procedure followed). Specifically, plant reliability was measured as the ratio of total hours of operation to the total hours a plant could have operated if it had not experienced a forced shut-down.

Violations. We examined six levels of violations severity for 1981 from computerized NRC files (see Osborn et al., 1983). The NRC classified the most severe conditions, such as the Three Mile Island accident, as a "severity 1 violation." Severity levels 2, 3, and 4 were also classified major violations. Severity levels 5 and 6 were classified minor violations. Minor violations included failures to follow administrative procedures and maintenance schedules and inadequate record keeping.

A nuclear engineer reviewed a number of reports of violations for 1981 as part of a larger project concerning the reliability of violations measures, reading the violations reports and classifying each infraction into one of the six severity categories. In over 90 percent of the cases, the reviewer's classification from the detailed NRC report was identical to the NRC's. Classification varied by only one level in the rest of the cases.

To minimize possible misclassifications, we collapsed the data into major (levels 1, 2, 3, and 4) and minor (levels 5 and 6) categories. Because the bases for some violations categories were adjusted after 1981, we used only 1981 data.

Other estimates of plant safety have been made, but we did not include them because they appeared biased, did not cover all plants, or were not publicly available. For instance, when a plant violates its technical specifications or experiences a forced shutdown, it must file a document called a licensee event report. Many previous investigators have used such reports to assess safety (Marcus, 1987). However, prior work (Osborn et al., 1983) suggested that there are substantial variations in reporting practices concerning these documents. The NRC has also conducted periodic audits of each plant through a process called Systematic Assessment of Licensee Performance. Unfortunately, these reports have not always been based on a common set of dimensions and did not cover all plants for a common time period (see Olson, Osborn, Jackson, & Shikiar, 1984). We also rejected the Institute of Nuclear Power Operation's audits of plant operations because they are censored before release and are not available for all utilities. Finally, the NRC has published extensive information on exposures and radiological releases. Unfortunately, complete data were available for fewer than 30 plants.

Other Measures

Information on plant characteristics, region, and the number of reactors at a utility was drawn from existing NRC records (U.S. Nuclear Regulatory Commission, 1982b). The size of a plant was measured as its gross megawatts at full capacity. Age was measured as the number of months since first operation at full capacity. We used dummy variables to differentiate boiling water reactors, pressurized water reactors made by Westinghouse, and pressurized water reactors not made by Westinghouse. A series of dummy variables also represented four NRC-designated geographic regions. The number of reactors was the number of commercially operating plants with a valid NRC license during 1981 for each utility.

Commitment to Nuclear Power and Prior Earnings

Initially, we sought detailed information on the management and organization of each plant from industry documents, interviews, and NRC records. However, detailed data on the management and organization of nuclear plants were not publicly available. Our interviews and detailed examination of utility records were curtailed when the NRC canceled its organizational research program in favor of confidential assessments by the Institute of Nuclear Power Operations. The NRC program had, however, already provided us with valuable insights and a fairly detailed knowledge of how this industry operates. NRC records were incomplete. For instance, the technical specifications for each plant are supposed to contain an organization chart for the plant and its utility as well as a short account of key technicians and managers. Unfortunately, the technical specification documents were not current for all plants, and many were so incomplete that they were useless for systematic analysis. Thus, we went to indirect measures.

Commitment to nuclear power was calculated as one minus the ratio of nonnuclear power generation to the total energy output of a utility for 1980; this index measures the percentage of a utility's total energy output provided by nuclear power and thus is a measure of the utility's reliance on nuclear power to satisfy energy demand. We took data on total energy output from Federal Energy Regulatory Commission records (U.S. Energy Information Agency, 1981a,b). We preferred this measure of investment to asset calculations simply because it was not always possible to isolate the values of production facilities.

Measuring the growth in earnings potentially available for additional safety investments and expenditures was more problematical. Financial data for utilities are subject to a number of accounting assumptions and adjustments. For instance, while a plant is in construction the amount of money used to finance the project is often listed as an asset under the assumption that state regulatory bodies will approve all expenses for plant construction and place such expenditures in the utility's rate base. An acceptable rate of return on those assets may be declared as earnings. Further, some nuclear utilities are private corporations, some are public corporations, and one, the Tennessee Valley Authority, is a quasi-federal agency. However, prior to 1981, the Federal Energy Regulatory Commission calculated a standardized balance sheet and income statement for all nuclear utilities using a common series of assumptions for public, private, and quasi-federal utilities. From those statements, it published data on earnings (U.S. Energy Information Agency, 1981a,b). For this study, we calculated the percentage of growth in earnings from 1975 to 1980 by dividing 1975 earnings by the figure for 1980.

Statistical Procedures

Although our data set includes almost the entire population of commercial reactors in utilities licensed to operate from 1975 to 1981, we used classical statistical tests because the goals of our data analyses were to identify theory-based explanations underlying reliability and violations (Blalock, 1974). Further safety data were for only one year. Since analyzing departures from linearity stretches the assumptions of standard statistical models (Blalock, 1974; McNeil, Kelly, & McNeil, 1975), we drew upon three complementary statistics approaches. Hypothesis 3 predicts that a nonlinear structural form will provide a significant improvement in explanatory power over a general linear form. To examine that departure from linearity, we employed hierarchical log-linear analysis using Goodman's chi-square partitioning method (Feinberg, 1981). In this approach, the curvilinear interaction is examined as an algebraic multiplication of two quadratic terms rather than a as single multiplication of the squared predictors. The procedure requires an analyst to categorize data and severely restricts the degrees of freedom available. Although the procedure can deal with the multicollinearity among interaction terms common in analyses of curvilinear interactions, the original selection of categories may affect interpretation.

McNeil and colleagues (1975) suggested building a series of hierarchical regression models with the sequential addition of main effects, curvilinear terms, linear interactions, and curvilinear interactions to examine curvilinear interactions with continuous data. Since interaction terms are likely to be highly intercorrelated, the regression weights may be highly unstable. However, the overall value of R^2 should not be strongly affected by multicollinearity. They suggested examining only the additions to explained variance by successively more complex nonlinear terms. Further, the procedure allows a researcher to enter a number of control variables to see if the predictors are important over and above the controls. In this study, size, age, type, number of reactors, and region were possible control variables. Prior work (Olson et al., 1986) and a preliminary series of regression analyses suggested that southern region, boiling water reactor, and single plant were the most important controls across all the safety-related criteria. Degress of freedom were too limited to include all control variables. (Data on the preliminary analyses and log-linear results are available from the junior author.)

Social scientists often independently judge results by examining unstandardized regression coefficients against standard errors (Nunnally, 1978). We have therefore reported those data. To aid interpretation of the findings, we graphed the regression results.

RESULTS AND DISCUSSION

Table 1 reports means, standard deviations, and intercorrelations. Correlations among the three measures of safety were modest, with the highest being the association between reliability and major violations (−.21). For the three measures of safety, the age and size characteristics were generally not substantial predictors. The correlations of region, type, and number of reactors with the safety-related criteria appeared sufficiently important to warrant incorporating those variables as controls in subsequent analyses. The most substantial correlation was between having a single plant and major violations ($r = .53$). These correlational results partially support general contentions made in the industry that type of reactor and region are important factors in safety analyses. There are also apparent regional differences in issuing violations. Whether they denote differences in the philosophy of regional NRC offices or substantive differences in utility practices needs to be more fully investigated.

Table 1 also shows the correlations of prior earnings growth and investments with subsequent reliability and violations. The data were generally consistent with Hypotheses 1 and 2. In relative terms, higher reliability was associated with both higher prior earnings growth and higher investment. The linkage between those predictors and major violations was more tenuous, and that for minor violations was mixed. As predicted by Hypothesis 1, higher investment was linked to a lower occurrence of minor violations. The correlation between minor violations and prior earnings was inconsistent with Hypothesis 2. This pattern is confirmed in the multivariate results, which must, however, be viewed with caution because instability caused by multicollinearity is likely and because the interactions were substantial.

Table 2 shows results for the curvilinear interaction analysis (Hypothesis 3). As expected, the results of the full regression equations for major and minor violations were significant, and most of the individual interaction terms were significant in the full regression equation for major and minor violations. The proportion of variance explained was substantial for both violations measures, with R^2 values of .53 for major violations and .74 for minor violations. However, the interactive results for major and minor violations differed, with only that for major violations conforming to Hypothesis 3.

Figures 1 and 2 graphically depict the substantial differences in the pattern of interactions for major and minor violations. For utilities with low investments, the number of minor infractions falls consistently as profit growth improves. Conversely, the rate of major violations climbs with earnings growth, only to decline for utilities with high profit growth. For

TABLE 1
Means, Standard Deviations, and Correlations for All Plants Studied[a]

Variables[b]	Means	s.d.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1. Plant size	734	211																				
2. Pressurized water reactor, Westinghouse	0.45	0.48	−09																			
3. Boiling water reactor	0.35	0.48	02																			
4. Pressurized water reactor, not Westinghouse	0.20	0.41	20	−43	−25																	
5. Plant age	74	31	−55	07	12	−14																
6. West	0.07	0.26	−14	13	−20	−13	−08															
7. Northeast	0.20	0.40	16	−19	16	07	02	−13														
8. Midwest	0.34	0.48	−17	09	13	−22	41	−20	−35													
9. South	0.39	0.49	21	−00	−15	23	−38	−22	−39	−56												
10. Single plant	0.19	0.40	−07	18	−22	−08	−06	57	22	−22	−26											
11. Reliability	0.85	0.20	01	07	15	−23	02	−29	−25	39	−03	−11										
12. Minor violation	4.48	4.45	16	−03	−16	11	−28	−15	−13	−48	−65	−08	−04									
13. Major violation	14.90	7.39	04	02	15	−25	−08	33	49	−34	−23	53	−21	14								
14. Prior earnings	1.63	0.46	08	−14	08	09	23	06	−38	13	15	−09	37	21	−10							
15. Investment	0.30	0.14	26	23	06	−25	05	−17	03	28	−20	−24	53	−44	−24	05						
16. PE^2	2.88	1.53	10	−24	02	30	23	03	−31	08	−16	−12	20	19	−13	−05	05					
17. I^2	0.11	0.08	24	24	03	−26	06	−01	13	25	−34	−11	42	−55	−14	95	96	−15				
18. PE × I	0.49	0.24	39	13	08	−14	07	−12	−11	30	−13	−26	53	−31	−25	45	89	34	82			
19. PE^2 × I	0.86	0.51	42	−02	05	05	08	−07	−21	24	−02	−24	43	−14	−23	67	62	67	55	91		
20. PE × I^2	0.18	0.13	37	21	05	−23	04	04	00	28	−30	−11	43	−47	−14	16	91	08	94	92	75	
21. PE^2 × I^2	0.30	0.23	45	13	05	−14	02	08	−11	28	−22	−11	41	−37	−14	37	80	32	81	94	89	95

[a] $N = 41$; $p < .05$ if $r > .26$; $p < .01$ if $r > .36$. Decimal points have been omitted.

[b] PE = prior earning; I = investment.

utilities with high investments in nuclear technology, the patterns for major and minor violations are virtually the inverse of one another.

The interactive results suggest that in one complex, dangerous technology for one time period, the risk propensities of executive constellations combined with the decision frame to influence safety outcomes. Consistent with our extensions of prospect theory, the interaction was curvilinear. However, we must stress five important points. (1) The results are suggestive, not conclusive. (2) The measures are indirect, with investment used to estimate risk propensities and profit growth to indicate the decision frame. (3) Our extension of prospect theory incorporated risk-taking as well as risk-averse decision makers. (4) Where executive constellations face other organizations within an industry setting, outcomes may reflect the combination of risk preferences and decision frame plus institutional factors. Here, for instance, the curvilinear interaction patterns were not the same for major and minor violations. This pattern may reflect institutional factors and differences in the perceived magnitude of risk (Jackson, 1987). (5) The examination concerned collections of executives charged with safely managing a complex, dangerous technology.

DIFFERING INTERPRETATIONS AND IMPLICATIONS

Social science investigations often stop with extensions of the theory underlying the examined hypotheses. However, the controversy concerning nuclear power, its importance, and the tradition in safety analysis call for an estimate of safety implications as well. Since we were centrally involved in numerous research projects designed to alter federal regulations, we had access to a wide variety of utility executives, regulators, safety engineers, and academics. We asked their assistance in interpreting the results.

Leadership

Industry proponents were generally quite critical of our work. None of the proponents felt that good management could be isolated statistically. However, they saw the bivariate results as generally supporting basic industry contentions. They suggested that regional NRC violations standards appear to vary and that the NRC should take corrective action. They held fast to their notion that a reliable plant was a safe one.

When faced with the interactive results and the notions of self-interest and framing bias, industry proponents were rarely dispassionate. Many dismissed the importance of minor violations as a measure of safety and concentrated on major infractions. Discussing major violations, some were quite eloquent in defending the industry. They identified rich, heavily committed utilities as leaders and said that leaders had more major infractions than other utilities because they were embattled, progressive innovators willing to challenge the wisdom of federal bureaucrats. Others suggested that NRC violations often concerned esoteric problems that only occur to those who

TABLE 2
Results of Regression Analyses[a]

	1981 Reliability				1981 Major Violations				1981 Minor Violations			
Variables Added[a]	b	s.e.	R^2	ΔR^2	b	s.e.	R^2	ΔR^2	b	s.e.	R^2	ΔR^2
South	−0.09	.07	.00	.00	−1.61	1.75	.05	.05**	−4.9**	1.92	.43	.43**
Boiling water reactor	−0.03	.06	.02	.02*	1.20	1.32	.07	.02	−0.84	1.61	.43	.00
Single plant	−0.04	.64	.03	.01	5.56**	1.98	.36	.29**	2.0	2.39	.49	.06**
Prior earnings growth, 1975−80	1.4**	0.48	.16	.13**	−21.5	17.9	.38	.01	26.1	21.3	.50	.01
Investment, 1981	22.6*	10.4	.42	.26**	−780*	292	.38	.00	758**	326	.59	.09**
PE^2	−0.54*	0.24	.53	.11**	6.2	7.8	.38	.00	−14.8	9.1	.59	.00
I^2	−65.7*	32.7	.56	.03*	2,236*	941	.39	.01	−2,931**	1,004	.62	.03*
PE × I	−29.4*	17.0	.57	.01	937*	396	.41	.02*	−1,123**	434	.65	.03*
PE^2 × I	9.6*	4.5	.58	.01	−276*	132	.42	.01	387**	142	.66	.01
PE × I^2	86.1	43.6	.58	.00	−2,786*	1,259	.47	.05**	3,998**	1,335	.67	.01
PE^2 × I^2	−27.6*	13.9	.63	.05**	847*	407	.53	.06**	−1,337**	428	.74	.07**
Constant	−1.19				−18.5				−9.7			

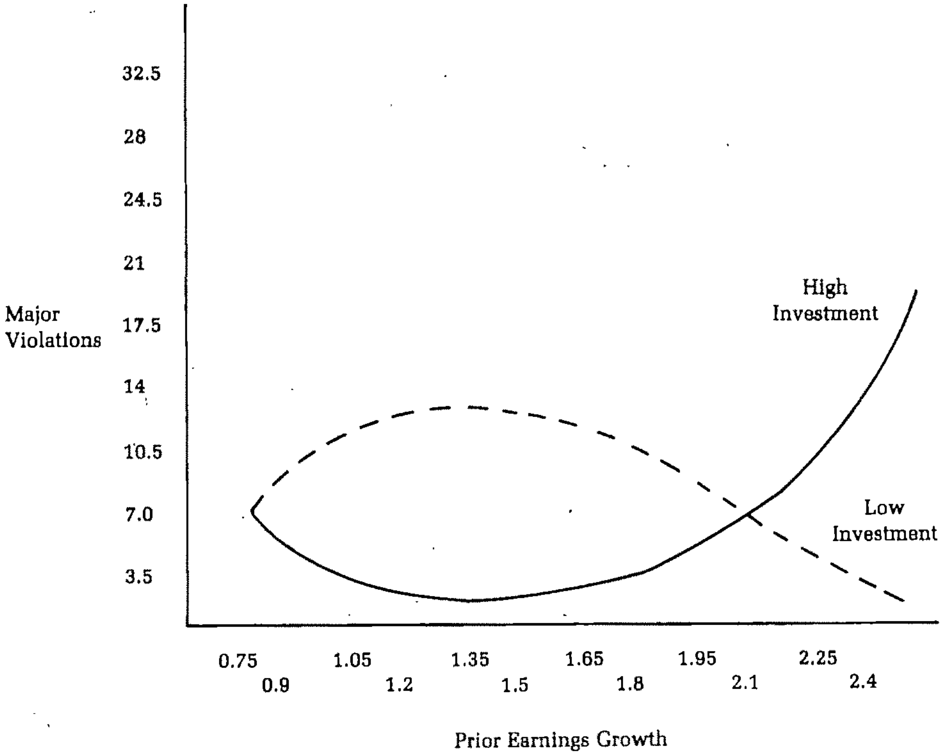
[a] Unstandardized regression coefficients are reported for final regression containing all variables, with $N = 41$, $df = 29$; R^2's for stepwise regressions with variables added in order of presentation and changes in R^2 for addition of new variable to stepwise regression are reported.

[b] PE = prior earnings; I = investment.

* $p < .05$

** $p < .01$

FIGURE 1
Prior Earnings Growth and Investment Predicting Major Violations[a]

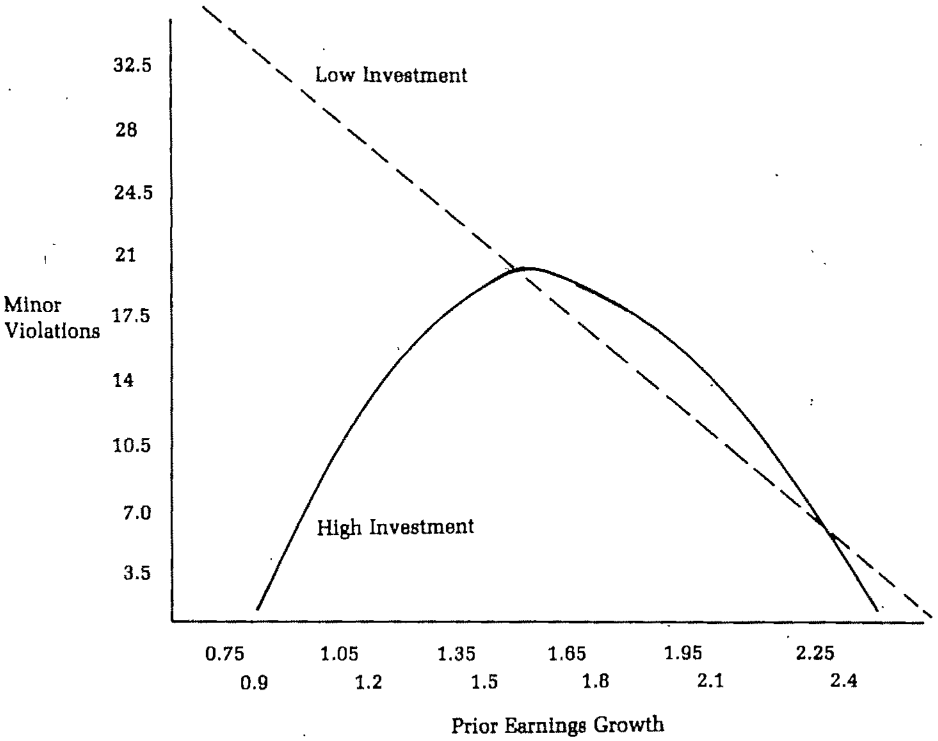


[a] Based on a full regression model containing curvilinear interaction terms but no controls.

do not have experience in operating a real plant. Many felt that the leaders were working on the real practical engineering problems and developing viable solutions.

Although many admitted to some problems in keeping plants on-line, many attributed those difficulties to overzealous, inappropriate, and excessive interference by regulators. To improve safety, they recommended that industry representatives conduct detailed observations to isolate successful practices; such a program would be similar to the current assessment program by the Institute of Nuclear Operations (Institute of Nuclear Operations, 1984). To us, their explanation suggested that safety in the nuclear industry is still a very primitive notion, poorly defined and without clearly measured dimensions. We suggest that some greater understanding and clarity might be obtained if proprietary data were made available to the research community. Specifically, uncensored evaluations by the Institute of Nuclear Power Operations, radiological release data, and insurance company estimates of

FIGURE 2
Prior Earnings Growth and Investment Predicting Minor Violations[a]



[a] Based on a full regression model containing curvilinear interaction terms but no controls.

risk could be combined with existing reliability, licensee-event-report, and violations data to develop multidimensional estimates of operating safeness.

Riverboat Gamblers

Critics of the nuclear power industry characterized utility executives more as conniving captains of corporate corruption than as progressive leaders. Critics often accepted the gambling and self-interest themes we have raised. In regard to the bivariate results, many suggested that it was clear that a reliable plant was not a safe one. Several relayed unconfirmed stories of plants being run while secondary or tertiary safety equipment was not operative.

Many critics focused on the interactive findings as evidence that the public should question the presumption of trust in granting utilities licenses to operate a technology that could alter the gene pool of the human species. Several saw the less committed utilities as merely incompetent, and more than one individual suggested that utilities with only one reactor should be forced to close it. For the more heavily committed utilities, they saw a sophisticated pattern of gambling, in which the utilities would conform to minor NRC requirements but avoid major investments in defense-in-depth. They characterized highly committed utilities as cautious when less profitable and as embarking on bold calculated risks when flush. Their characterization is consistent with our description of a riverboat gambler.

Both this interpretation of our results and the first one place a very heavy emphasis on the attitudes and unseen actions of utility executives. The critics' interpretation assumes that executive propensities toward investment risks are virtually identical to their willingness to risk public health and safety. We need to investigate whether, under what conditions, and how executives' risk propensities actually translate into public risk.

Purposeful Unintended Consequences

There is a third interpretation that melds our prior work in the industry with the current findings. We see purposeful but unintended consequences that pose unknown risks to the public from this dangerous complex technology. Unintended consequences arise from the lack of knowledge concerning how to run a safe, efficient plant. We use the label "purposeful" because utility executives have (1) systematically worked against open inquiry concerning management and organization influences on safety and (2) promulgated a series of self-serving myths concerning the management and organization of this technology.

Three important myths prevail. Mythology within the industry suggests that a reliable plant is a safe plant, but the current data and other analyses suggest that different aspects of safety are not highly related. Industry representatives claim their utilities are well suited to managing this complex technology. It seems more likely that the technology is competence-destroying. That is, managerial experience in and administrative arrangements designed for fossil-fuel or hydro generation appear inappropriate for nuclear operations. Finally, executives reject the notion that they would put their own interests above those of the public or stockholders. We presume they do and that their actions are consistent with their collective propensities toward risk.

To illustrate this notion of purposeful unintended consequences, we can review the interactive findings and also isolate some potential safety threats.

Normal Accidents, Inappropriate Trade-Offs, and Acquiescence in Utilities with Low Commitment

The dotted lines in Figures 1 and 2 show the pattern of results for utilities with comparatively low investments in nuclear technology. When their earnings are poor, these conservative utilities have few major violations but many minor ones. If Perrow (1984) was correct, minor violations may represent risks from normal accidents. Numerous minor problems increase the chances that unrelated events may occur simultaneously and threaten safety. We propose that these utilities do not have the discretionary resources to comply with all NRC dictates. Lacking sufficient managerial oversight, plant personnel, specialized staff, or funds for extensive external contracting, they accept higher risks from normal accidents and concentrate on major problems.

A moderate record of earnings growth may provide conservative utility executive constellations with more discretion to invest in safety than is available to utilities with low earnings. Yet these conservative constellations apparently trade a low number of minor violations for a high number of major violations. We propose that the competence-destroying character of nuclear operations plays a role in that trade-off, reinforcing the myth of criteria linkage and executives' conservative posture toward risk. Conservative senior executives relying on inappropriate experience may well press to reduce all types of safety risks. Because of the myth of criteria linkage, however, questionable trade-offs between major and minor violations can emerge.

Conservative executive constellations whose firms show robust earnings growth apparently accept all proposals for complying with NRC mandates. Both major and minor violations are comparatively low. Choices are not necessary—the utility tries to comply. However, even those plants may not be safe if the record of violations merely represents acquiescence to NRC mandates rather than independent analysis by the utility (Marcus, 1987). Further, just as reliability, minor violations, and major violations are not highly related to one another, these three may not be highly correlated with other measures of safety that assess risks on other safety issues.

Safety Risks in Heavily Committed Utilities

The solid lines in Figures 1 and 2 represent the utilities studied that had a high proportion of their investments in nuclear technology. If we consider those utilities technological risk-takers, we can make the following interpretation. Under losses, the framing bias operates, and there is a preference reversal—risk takers merely comply with minor NRC mandates. With limited resources, they appear to minimize the total number of violations and allow some major issues to go unresolved. With moderate earnings growth, utilities may move beyond gross compliance toward an analysis of both major and minor safety issues. Their earnings growth puts them in a position to allocate more staff members and resources to safety issues. However, since criteria are not highly correlated, working on major issues does not translate into reducing the risks from the accumulation of minor violations involved in normal accidents.

Heavily committed utilities with high earnings growth and, therefore, considerable discretionary resources may better handle the myriad of details that need to be taken care of to operate a nuclear power plant safely. But such an emphasis on minimizing what we have called normal accident risks may not translate into resolving major safety questions.

Richer utilities appear to have more staff units, plant workers, and layers of management in a historically bureaucratized and centralized administrative arrangement (Olson et al., 1984; Osborn et al., 1983). Such arrangements may be dysfunctional if they separate technical areas from one another and separate plant management from a utility's executive constellation. With a centralized administration, it may be difficult to address major issues that cut across technical areas (Egan, 1982). Major safety issues may be pushed up the hierarchy to isolated, risk-seeking executives. The highly unlikely events and scenarios underlying major safety issues might well be dismissed. The prior success of the utility and its position of industry leadership present executives with a very positive frame. Further, the overall picture for safety may also appear favorable because heavily committed utilities with multiple plants generally have higher reliability records than less committed, single-plant utilities. In industry jargon, "Our reliable plants are safe; so if it ain't broke don't fix it; we will move on new technological challenges." In the process, these utilities are apparently willing to assume the unknown risks associated with a measurably higher number of major violations.

Our notion of purposeful unintended consequences rests on a series of complex relationships among several factors. It is quite possible that for many utilities and for much of the operating life of a nuclear facility, other factors may negate the safety implications of purposeful unintended consequences. However, in analyses of complex, dangerous technologies, where the consequences of an accident can be so devastating, the potential importance of ignorance and self-serving mythology combined with executive risk preferences should not be easily dismissed. For instance, Weick (1987) suggested that among workers in dangerous technologies, stories and myths are quite prevalent and may be functional. They may help workers cope with the complexity of the technologies and provide on-the-job variety. Conversely, we suggest that myths may be self-serving and combine with other factors to yield safety problems. Given the complexity of many dangerous technologies and the difficulty of estimating safeness, we suspect both interpretations may be partially correct for some aspects of safety. To begin disentangling such complex relationships, we need both (1) more empirical estimates of safety and (2) analyses that combine the views of industry participants and industry critics under several different theoretical perspectives.

CONCLUSIONS

Results of this study suggest that in addition to Perrow's (1984) normal accidents, investigators need to consider the safety risks associated with purposeful unintended consequences. Purposeful unintended consequences may not emerge until research compares a series of externally defined concepts with industry-based explanations in order to analyze performance on multiple criteria across an entire industry. Such a perspective calls for a continual exploration and comparison of views that include a detailed recognition of industry history and context. Merely subscribing to a singular theoretical interpretation or managerial perspective may be misleading. We therefore extended current theory and incorporated industry-based explanations to derive an alternative explanation of the results.

Our analysis clearly suggests the need for more data on the operation of complex, dangerous technologies. Far too many of the results appeared contrary to industry wisdom and far too few data on this dangerous industry were publicly available. Perhaps all nuclear plants are safe enough; perhaps none are. Some utility executive constellations may be leaders; some may be riverboat gamblers. Our results suggest that purposeful unintended consequences arising from executive risk preferences, in combination with ignorance and self-serving mythology, may threaten safety in one complex, dangerous technology. We need much better data to be sure.

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RESEARCH NOTES

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POLITICAL LEGACY OF ADMINISTRATIVE SUCCESSION

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Studies of succession outcomes have reported mixed results. Several recent studies have suggested that consideration of organizational circumstances at the time a succession occurs enhances understanding of succession's consequences. Aspects of organizational context examined in these studies have included size, control or ownership patterns, strategy, and power distributions (Carroll, 1984; Reinganum, 1985; Virany, Tushman, & Romanelli, 1985; Worrell, Davidson, Chandy, & Garrison, 1986). The authors have argued that those aspects influence succession's impact on subsequent organizational performance.

For example, Carroll noted that when a change in a control structure accompanies succession, organizational performance may be influenced because the succession has involved not only replacement of an individual but also redefinition of the role the successor is to play (1984: 97). This redefinition is expected to influence subsequent organizational performance. Carroll's results, however, suggest that some redefinition may be present in a succession even when the control structure remains unchanged (1984: 111).

Indeed, Pfeffer (1981: 228) viewed succession as one of the few situations in which redefinition of organizational strategies and practices occurs. Employing a political perspective (Pfeffer, 1981; Pfeffer & Salancik, 1978; Zald, 1965, 1970), he argued that succession may occur when interdependent organizational groups who have conflicting preferences that cannot be accommodated under prevailing resource conditions create pressures for change. During the selection process, the preferences of those groups manifest themselves in political activity attempting to influence the choice of a successor. The groups also hope to influence the role and behavior of the successor by influencing the selection decision. Thus, Pfeffer suggested that political activity during succession contributes to a redefinition of organizational strategies and practices.

In this study, we empirically examined the influence of political activity during succession on post-succession outcomes. If political activity does contribute to redefinition, we would expect to see a relationship between the political activity occurring during the selection process and activities of the chosen successor. Expectations about what should or may happen after succession are formed through political activity. Because the preferences and expectations of coalitions formed during succession will be somewhat enduring (Zald, 1965), selecting a successor does not automatically end differences among coalitions. Political activity, then, creates a polarized situation, in which there are winners and losers, into which a successor is placed. Thus, successor influence will not be unilateral (Pfeffer & Salancik, 1977, 1978); after successors take over, the preferences of political coalitions formed during the selection process are likely to influence their activities.

However, prior organizational conditions are also likely to influence successors' activities, especially to the extent that those conditions place limits on future organizational capabilities (Baldridge, 1971; Pfeffer, 1981; Zald, 1965). In particular, historical resource conditions should be important, as they create the resource environment in which an organization must operate. We expected that resource environments would moderate the influence of political activity on successors' activities. Organization members can express as many preferences as they want and not have them satisfied because of a lack of resources. Even when resources are abundant, organization members may not perceive them to be sufficient. Katz and Kahn (1978) alluded to this phenomenon when they suggested that organizations have an inevitable preference for growth. What is sufficient today is frequently not perceived as sufficient tomorrow. The presence of abundance, however, may also reduce the impact of political activity, since freedom from resource concerns allows individuals to turn their attention elsewhere.

The present study extended the work of Welsh and Slusher (1986), who found that the extent of political activity exhibited during selection depended on an interaction of organizational conditions. In this study, we asked whether an organization's resource environment influences the relationship between political activity and two related succession outcomes: (1) a successor's resource acquisition and allocation activities and (2) a successor's involvement in general administrative activities. Although those issues are related, they represent distinct activity domains for successors. Thus, we were also interested in whether the combined influence of the resource environment and political activity would be the same for each type of activity.

The influence of political activity on a successor's activities is likely to depend on an organization's resource environment because it provides both limitations and direction for the successor. The resource environment may inhibit or facilitate a successor's ability to meet expectations shaped by political activity during the selection process. With scarce resources, the impact of a successor's actions will be much less ambiguous than it will be when resources are abundant. Coalitions that emerged during selection know what trade-offs have been made among demands for resources. Even if a successor is willing to satisfy extant demands, a lack of resources may preclude this. When resources are abundant, however, a succcessor has the slack necessary to negotiate with various coalitions. Such negotiation may mitigate any lingering opposition engendered by political activity. Thus, we expected that the influence of political activity on successor activities would depend on resource conditions. Since resource scarcity constrains a successor's ability to meet constituent demands arising through political activity, the relationship between political activity and successor activity should be stronger when resources are scarce than when they are abundant.

METHODS

Research Setting, Procedures, and Respondents

The research was set in a number of professional colleges of major state universities in which a new dean was being selected. Previous research has used the same setting (cf. Welsh & Slusher, 1986). Colleges were selected by reviewing advertisements of dean's position openings in the *Chronicle of Higher Education* for a two-year period (December 1979–December 1981). The included colleges were located in either land grant universities or major state-supported universities. They therefore had a degree of homogeneity in resource base, funding procedures, mission, and technology. That homogeneity was further enhanced by selecting professionally oriented colleges within each university. Forty professional colleges of agriculture, business, education, and engineering met all the criteria for inclusion in the study.

Data were collected in three stages. Stage one was a cross-sectional mail survey of faculty members conducted during each college's search process and verified by telephone interviews (Welsh & Slusher, 1986). Those researchers drew a stratified, random sample of 960 faculty members, equally divided into full, associate, and assistant professors, using complete university- or college-published listings of the faculty in each college at the time of the search process. The college faculties sampled ranged in size from 59 to 211 members. Each faculty member received a packet through first-class mail containing an explanatory letter, a questionnaire, a postage-paid return envelope, and a card for requesting a summary of the research findings. About one week after the initial mailing, follow-up letters were mailed to each college dean's office for distribution to individual faculty members. The response rate was 52 percent (502 questionnaires returned), with 6 to 19 faculty members responding from each college (55–76 percent). Chi-square tests showed that respondents did not differ significantly from nonrespondents in terms of academic rank and tenure.

Stage two consisted of collecting archival data on the resource levels in the university environment during the five-year period preceding the dean-selection process. This information was obtained from publications of the National Center for Education Statistics (Brandt, 1980, 1981; Brandt & Ni, 1979; Mertins & Brandt, 1976, 1977).

The final stage of data collection, approximately three years later, involved both telephone interviews and questionnaire surveys. Telephone interviews with dean's office employees in each of the colleges determined whether a dean had been selected and was still in place. Four schools that had failed to select a new dean were dropped from the study. Questionnaires were then sent to a rank-stratified random sample of the faculty members who had participated in stage one and filled out a card requesting research results ($n = 200$). Given the high response rate per college in stage one, and cost considerations, the second sample was developed using procedures for drawing economic samples (Kish, 1965). These faculty members had knowledge of the complete succession process, including conditions before, during, and after succession. Thus, they shared a common organizational experience (Wagner, Pfeffer, & O'Reilly, 1984). The response rate on the second survey was 51 percent (102 questionnaires returned), with two to five faculty members responding from each college. It should be noted that some of the nonrespondents may have left their institution. Chi-square tests showed that respondents did not differ significantly from nonrespondents in terms of rank or tenure.

Measures

Archival and questionnaire measures, both created especially for this research, were used. We conducted pretests of the proposed measures (results of the pretest analysis are available from the first author). The Appendix presents the final form of the measures employed in this study.

Political activity. A political activity scale was administered to the first faculty sample while the selection process was occurring. We patterned the scale after a measure developed by Kipnis, Schmidt, and Wilkinson (1980) that is based on a set of influence strategies usable in work situations. A list of ten behaviors that faculty members could use to influence the process of selecting a dean was developed through interviews with faculty members. The political activity measure based on this interview information asked respondents to indicate how often they observed others in their college engaging in the ten specific political behaviors. The college-level measure of political activity was the mean response for all respondents in each college. High scores on this measure indicate extensive political activity during the selection process.

Resource environment. Measures of each college's resource environment were obtained from information on state revenues and on grants and contracts awarded to universities, a college's primary sources of funds. This information indicates overall resources available to higher-education institutions and funds awarded on a discretionary basis. Since the budgeting systems at most universities are formula-based, and incremental, available funding for a college is closely related to the funds allocated to its university. Because the colleges studied differed in characteristics relevant to funding such as the sizes of enrollment, faculty, and the state population providing a tax base, it was necessary to adjust for size differences in measuring the colleges' resource environments.[1] Using information on state revenues and grants and contracts received by universities in *Financial Statistics of Institutions of Higher Education* (Brandt, 1980, 1981; Brandt & Ni, 1979; Mertins & Brandt, 1976, 1977), we created proportional change scores representing the changes in state revenues and in grants and contracts over the period for each college in the survey.

Resource activity. Faculty members in the second sample were asked to indicate the new dean's level of resource activity by indicating the extents to which the dean reallocated resources, needed to pursue external funds, and was successful in acquiring those funds. The college measure was the mean faculty response. High scores on this measure indicated a high level of resource activity by the new dean. To see whether faculty perceptions of resource activity were consistent with any overall college change requiring such activity, college scores on the resource activity measure were correlated with two archival measures constructed from information obtained in the telephone interviews: (1) change in the number of departments in the college over the period, on an absolute scale ($r = .54$, $p < .05$) and (2) change in the size of the college faculty over the period ($r = .41$, $p < .06$). The pattern of relationships obtained indicated that faculty members perceived resource activity as increasing when objective college conditions changed.

Administrative activity. During the selection process, the first faculty sample was given a list, generated through interviews with faculty members before questionnaire development, giving nine activities of an effective dean. Respondents were asked to indicate the activities' relative importance. The mean college responses on each of the nine attributes ranged from 2.93 to 5.0 (3.0 indicated moderate importance). These responses indicated that faculty members in each college viewed the activities as important for a dean. The second faculty sample received the same list and was asked to indicate the extent to which the new dean pursued the activities. The college score was the mean faculty response. High scores on this measure indicated the faculty perceived high involvement by the dean in these activities.

Aggregation procedures. Prior to aggregation, the responses of faculty members in each college were examined for agreement. Using Kendall's coefficient of concordance (Daniel, 1978; Kendall & Babbington-Smith, 1939) as the agreement measure, concordance coefficients were calculated for each college's faculty. For the first sample, the college coefficients ranged from 0.68 to 0.83; for the second sample, the coefficients ranged from 0.77 to 0.85. Each coefficient indicated statistically significant agreement at the $p < .05$ level or better. Additionally, two intraclass correlations were developed, one of faculty-member agreement within colleges and the other of the extent to which the 36 colleges could be reliably differentiated by faculty member's perceptions on each measure (James, 1982). The results indicated that the aggregation of faculty responses into college-level measures was appropriate.

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[1] Since we were interested in overall trends in resource environments rather than in the actual value of revenues the colleges received, we constructed ratio measures, using the earliest year's revenues as a base. Those measures allowed us to compare changes in resource environment experienced by colleges of different sizes. As proportions may not be of equal variance, the arcsine transformation (Cohen & Cohen, 1975: 254–277) was performed on these ratio measures prior to analysis.

Analyses

Multivariate regression analysis followed by multiple regression analyses were performed to assess the relationship between political activity, resource environment, and post-succession outcomes (Bock, 1975; Cohen & Cohen, 1975; Stevens, 1986). Those steps allow the prediction of several dependent variables from a set of independent variables and are appropriate when dependent variables are differentiated aspects of a single underlying variable (Stevens, 1986: 99). In this research, the dependent variables of resource and administrative activity represented two distinct yet related issues for a new dean. Independent variables in the regression analyses were political activity, proportional change in state revenues, proportional change in grants and contracts, and two interaction terms representing the interaction between political activity and the trend in revenues and the interaction between political activity and the trend in grants and contracts. The multivariate test determined whether there is a significant relationship between the two sets of variables, and univariate F-tests assessed the significance of the regression of each dependent variable separately.

RESULTS

The zero-order correlations (Table 1) indicate that there were no significant linear relationships between either one of the succession outcomes and either political activity or the measures of resource environment. The research questions, however, concerned interactions. The results of the multivariate test for the total model were significant (Wilks's lambda = .44; $F_{10,58} = 2.96$, $p < .01$), as were the results of the hierarchical multivariate tests for the unique contribution of each of the terms in the model (Table 2). Since our focus was on the interactions, we also performed a separate multivariate test of the contribution they made entered as a set. Results of this test were significant (Wilks's lambda = .53; $F_{4,58} = 5.44$, $p < .001$), suggesting that variations in succession outcomes are indeed related to an interaction between political activity and resource environment. Having determined that multivariate significance existed, we proceeded to examine the separate multiple regression results.

The regression results for the two succession outcomes (Table 2) indicated that different combinations of variables were related to the two outcome variables. The interaction between political activity and the trend in grants and contracts explained variance in resource activity, with the trend in state revenues making no significant contribution. To ease explication of these results, we dichotomized the variable measuring the trend in grants and contracts, using a median split. Since all the universities received increases in both revenues and grants and contract awards, differences in resource

TABLE 1
Means, Standard Deviations, Ranges, and Correlations[a]

Variables	Means	Standard Deviations	Ranges	Correlations 1	2	3	4	5	6	7
1. Political activity	27.53	4.25	16.80−37.25	(.93)						
2. Trend in state revenues	0.51	0.14	0.30−0.75	.28						
3. Trend in grants and contracts	0.50	0.21	0.16−0.83	.18	.49**					
4. Political activity × trend in revenues	0.75	0.38	0.30−1.49	.82**	.75**	.40**				
5. Political activity × trend in grants	0.73	0.53	0.16−1.65	.72**	.55**	.77**	.81**			
6. Resource activity	3.32	0.85	1.11−5.00	.30	.01	.17	.21	.21	(.92)	
7. Administrative activity	3.96	0.62	2.24−4.86	.09	.13	.28	.04	.13	.43**	(.88)

[a] Reliability estimates appear on the diagonal. N = 36.

$^{**}p < .01$

environment reflect differences in sizes of the proportional increases. Colleges with values at or below the median ($N = 18$) were considered to be in environments with relatively scarce resources because their proportional increase in funding was low. Colleges with values higher than the median ($N = 18$) were considered to have relatively munificent environments. We then plotted the cell means (Figure 1a). The form of the interaction indicates that for both poor and munificent resource environments, the relationship between political activity and resource activity was positive.

As expected, however, the relationship between political activity during selection and resource activity differs for the two resource environments. When resources are scarce, there is a positive relationship between political activity and resource activity ($b = 1.42$). When resources have historically been abundant, the relationship between political activity and resource activity is again positive ($b = .49$). The test of significance for this interaction ($F_{1,34} = 5.92$, $p < .03$) indicated that the relationship is stronger when resources are scarce than when they are abundant.[2]

The interaction between political activity and the degree of increase in state revenues primarily explained variance in administrative activity, with the degree of increase in grants and contracts making a marginal contribution.

TABLE 2
Results of Multivariate Regression Analyses

	Results of Multivariate Analyses		Results of Multiple Regression Analyses[a]	
Variables	**Wilks's Lambda**	***F***	**Resource Activity**	**Administrative Activity**
Political activity	.64	8.05**	0.79	2.33**
		(2,29)	(1,30)	(1,30)
Trend in state revenues	.69	6.57**	−0.55	1.49**
		(2,29)	(1,30)	(1,30)
Trend in grants and contracts	.80	3.68*	1.42**	0.87†
		(2,29)	(1,30)	(1,30)
Political activity × revenues	.70	6.18**	0.38	−1.05**
		(2,29)	(1,30)	(1,30)
Political activity × grants	.83	2.91†	0.49*	1.78
		(2,29)	(1,30)	(1,30)
Overall *F*	.44	2.96**	2.22†	4.14**
		(4.58)	(5,30)	(5,30)
Adjusted R^2			.15	.31

[a] Coefficients are standardized regression coefficients; degrees of freedom are in parentheses.
† $p < .10$
* $p < .05$
** $p < .01$

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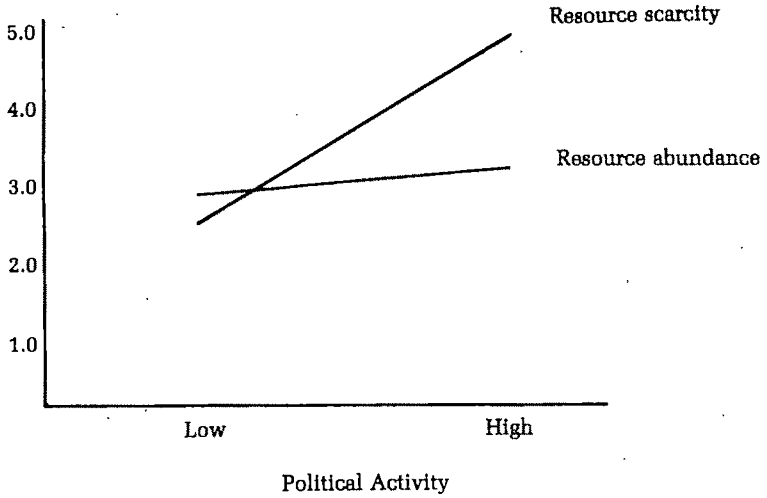
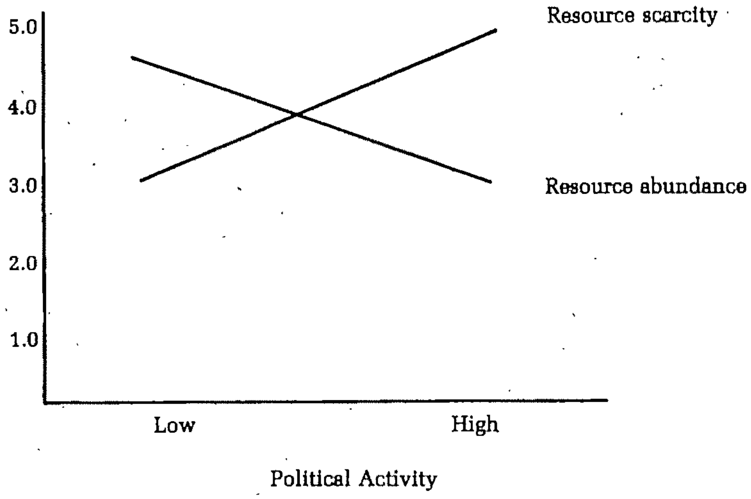
[2] This test was equivalent to a test of the betas; see Dutta (1975: 178).

FIGURE 1
Relationship Between Political Activity
and Successor Activity Under Different Resource Conditions[a]

a. Resource Activity



b. Approval of Administrative Activity



[a] Colleges considered to have scarce resources had proportional increases at or below the median. Colleges considered to have abundant resources had proportional increases above the median.

Again, to ease interpretation of the interaction, we dichotomized the state revenue variable at the median (Figure 1b). When revenues were scarce, the relationship between political activity and administrative activity was positive; when revenues were abundant, the relationship was negative. These findings suggest that, as expected, the relationship between political activity during selection and a dean's involvement in administrative activity depends on the resource conditions prevailing before succession. The nature of this interaction, however, is surprising.

When historical resources, as expressed by the trend in state revenues, are scarce, the relationship between political activity during selection and a dean's involvement in administrative activity is positive ($b = 1.49$). When resources are abundant, however, the relationship is negative ($b = -1.05$). Moreover, when the interaction is tested, the relationships under the two resource conditions are significantly different ($F_{1,34} = 7.62$, $p < .01$).

DISCUSSION

Previous studies of succession consequences have uncovered relationships between organizational context and subsequent organizational performance. These studies have, however, only hinted at what changes in internal organizational processes may have occurred during succession and resulted in a change in performance. The present research is a modest beginning toward examining the internal processes relevant to succession outcomes.

Two outcomes of the succession process were examined in this study. For resource activity, the results suggest that resource scarcity heightens the salience of successor activities, thus rendering political activity more important as a means of influencing the outcomes of those actions. A similar pattern emerged for administrative activity. When resources were scarce, colleges exhibiting high political activity reported high involvement on the part of the dean in administrative activity; when resources were abundant, high political activity was associated with low dean involvement. With resource scarcity, political activity seems to increase the likelihood that a dean will be involved in administrative activity to reconcile competing demands. When resources are abundant, however, we saw low dean involvement in administrative activities in colleges exhibiting high political activity during the selection process. In that situation, abundance may free the dean from the need to be involved in administrative activity, or the political activity may be directed toward issues other than administrative ones.

Prior performance may influence the extent of a dean's involvement in administrative activity. That is, colleges that have performed well historically provide a stronger base of operations for a successor than do colleges that have not. Of course, colleges with strong reputations may be able to attract highly capable successors. No direct measure of performance was available for this study. Using national rankings of graduate programs as a surrogate measure of performance (Gourman, 1985), we observed no relationship between ranking and the dean's involvement in administrative activity.

Thus, for the colleges in this study, prior performance appears unrelated to the subsequent activity of their deans.

The redefinition process that Pfeffer (1981) wrote about seems to be facilitated by political activity when resources are scarce. Perhaps that finding reflects an acceptance that resource scarcity threatens everyone's survival, thus enabling a successor to generate support through appeals for the common good. Iacocca's (1984) success at Chrysler may be an example of this phenomenon. When resources are abundant, political activity seems to inhibit the redefinition process, which may simply reflect changes in aspiration levels and perceptions of equity. Abundance is a relative phenomenon, and it promotes expectations of continued abundance. Under scarcity, inequitable distribution of benefits or unequal treatment is more likely to be accepted as a temporary means of solving problems. Under abundance, however, people may expect to benefit according to their contributions. Thus, for a successor, even the most straightforward issues may involve complex trade-offs among constituent groups.

Two other characteristics of this study may limit its generalizability. It has been suggested that professional organizations are more political than other organizations (Mintzberg, 1979). Thus, our evidence of the political consequences of succession may be a function of the type of organization studied. Additionally, organizational size may influence the outcomes of succession (Dalton & Kesner, 1983; Reinganum, 1985). We studied relatively small organizations. Smallness may facilitate the communication of political preferences, increasing the potential for political effects. Research in other settings is needed to ascertain the generalizability of our findings.

Future research should also be directed toward examining the relationships among prior organizational conditions, internal processes such as conflict and political activity, and post-succession outcomes. Such an effort might resolve the inconsistency in results regarding the ultimate impact of succession on organizational performance.

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APPENDIX

The following scales were employed in this study.

Political Activity

How often did you observe other faculty:

a. joining with others in supporting the appointment of certain faculty to the search committee?

b. talking to members of the search committee about the criteria to be used in selecting a dean?

c. contacting alumni to develop support for a specific candidate?

d. encouraging others with similar views to talk to the search committee members about the criteria to be used in selecting a dean?

e. encouraging faculty members to support a specific candidate?

f. seeking the support of administrators for a set of criteria to be used in selecting a dean?

g. contacting faculty in other schools to obtain information in support of a specific candidate?

h. joining with others to support the use of a set of criteria by the search committee?

i. seeking the support of administrators for a specific candidate?

j. joining with other faculty in support of a specific candidate?

(Responses could vary from 1 = never to 5 = almost always.)

Resource Environment

Trend in state revenues. The numerator of the trend ratio was the difference between 1979 state revenues and 1975 state revenues. This value was divided by the 1975 state revenue level (denominator). Among the universities sampled, this proportional change score ranged from 0.30 to 0.75, indicating an overall increase in state revenues for each institution. The size of individual increases varied.

Trend in grants and contracts. The numerator of the trend ratio was the difference between the 1979 awards and the 1975 awards. This value was divided by the 1975 awards (denominator). Among the universities sampled, this proportional change score ranged from 0.16 to 0.83, again indicating an overall increase in grants and contracts for each institution, with the size of individual increases varying.

Resource Activity

You have characterized the strategy of the new dean [on a continuum ranging from major contractions in operations to major expansion in operations]. In implementing the college's strategy, to what extent:

a. have its objectives required shifts in resource allocation patterns by the dean?

b. have its objectives required the pursuit of external funding by the dean?

c. has the dean been successful in acquiring outside funding to meet these strategic objectives?

(Responses could vary from 1 = little to 5 = a great deal.)

Administrative Activity

Listed below are responsibilities and activities in which deans typically are involved. To what extent does the dean:

a. work well with faculty in the college?

b. maintain or build good relations with the central campus administration?

c. support faculty efforts to maintain or build good relations with the central campus administration?

d. demonstrate good administrative skills?

e. exhibit support for the college's alumni?

f. maintain external ties with the profession?

g. reward faculty for maintaining external ties with the profession?
h. display commitment to building to college's national reputation?
i. support faculty commitment to building the college's national reputation?
(Responses could vary from 1 = not at all to 5 = a great deal.)

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